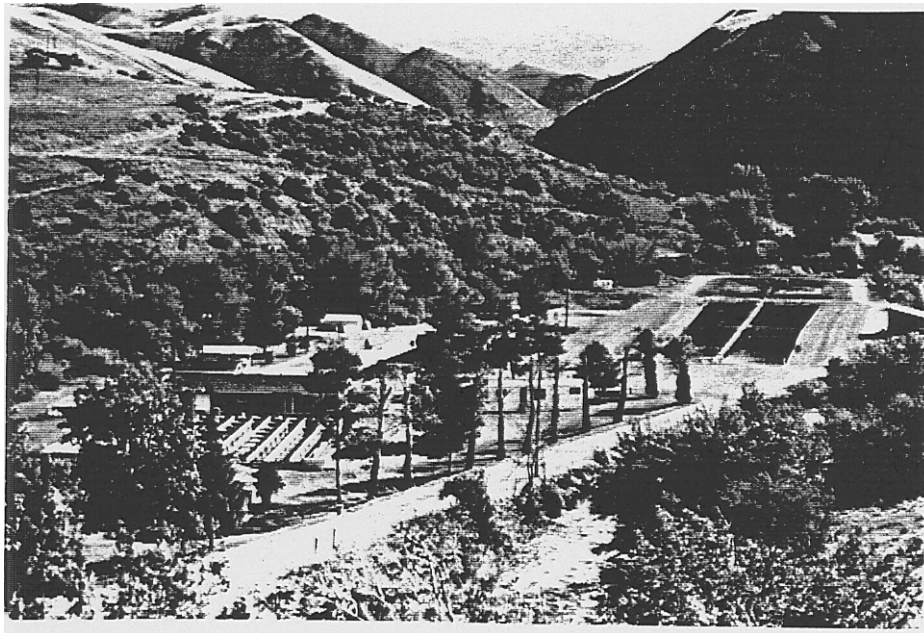




RAPID RIVER HATCHERY

1994 CHINOOK BROOD YEAR REPORT



by

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ABSTRACT

The Rapid River trap operated from March 16 to September 20, 1994. From May 16 to July 25, 265 spring chinook *Oncorhynchus tshawytscha* were collected. This included 261 adults and four jacks. The Oxbow Hatchery trapped 29 spring chinook in Hells Canyon, and transported them to Rapid River for spawning. The sex ratio for the combined Rapid River and Snake River returns was 126 adult males (42.86%), 163 females (55.44%), and five jacks (1.70%) for the total combined return of 294 fish. The age-class structure was 4 three-year olds (1.51%), 139 four-year olds (52.45%), and 12 five-year olds (46.04%) for spring chinook returning to Rapid River Hatchery Rapid. Summer chinook, totaling 23 adults (14 males, 9 females) and two jacks, were trapped from July 18 to September 2. Summer chinook were released into Rapid River Hatchery above the hatchery. The age-class composition of the summer component of the 1994 run were 2 three-year olds, 9 four-year olds, 14 five-year olds. There were 33 wild and 10 hatchery steelhead *Oncorhynchus mykiss* trapped from March 21 to May 25. Wild steelhead were released above the hatchery. Hatchery steelhead were released into the Little Salmon River. A total of 147 bull trout *Salvelinus confluentus* were trapped and released into Rapid River Hatchery above the hatchery from May 24 to August 3.

In 1994 the sport fishery on the Little Salmon River was canceled due to the small run. The Nez-Perce tribal fishery ran from June 3 through June 7. Tribal officials did not report harvest data. Prespawning mortality was 20 adult males (6.8%), 41 females (13.9%) for a total of 61 fish (20.7%). Spawning took place from August 15 to September 18, 1994. A total of 116 females were spawned yielding approximately 490,249 green eggs. As spawning progressed and Enzyme-Linked Immunosorbant Assay (ELISA) results were reported 58,791 eyed eggs (from 67,170 green eggs from 16 females) were transferred to Clearwater Hatchery. After enumeration and primary picking the total inventory at Rapid River Hatchery was 386,282 eyed eggs (based on electronic count with a Jentsorter TM, counter). Average fecundity was 4,231 eggs per female from 100 females and survival to eye-up was 91.3%. Survival to swim-up was 88.7%. From November 27, 1994 to February 24, 1995 fry were moved into four raceways. Mortality during the initial rearing period prior to marking was 5,412 or 1.4%. Marking of Brood Year 1994 fingerlings started on June 27, 1995. The marking crew reported adipose fin clipping of 379,865 fingerlings (+2.6% from hatchery inventory). As in the past this number was used for inventory at the start of final rearing. Marking also included implant of 65,628 coded-wire tags (CWT). Prior to release 19,191 were Passive Integrated Transponder (PIT) tagged. From March 19 to April 16, 1996, 379,167 smolts (22,605 lbs) were released to Rapid River. This was a survival of 99.8% for the final rearing period after marking. Feed conversion for 1994 brood year spring chinook was 1.35 prior to the start of volitional release.

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INTRODUCTION

Funding Source

Rapid River Hatchery was constructed in 1964 by Idaho Power Company (IPC) to mitigate for losses of spring chinook salmon *Oncorhynchus tshawytscha* resulting from the construction of Brownlee, Oxbow, and Hells Canyon dams on the Snake River. Mitigation mandated by the Federal Energy Regulatory Commission required IPC to transplant the run of spring chinook salmon from the Snake River to the Salmon River drainage and to provide funds for the production of three million spring chinook salmon smolts annually. These fish are designated for release into Rapid River and the Snake River below Hells Canyon Dam. Rapid River Hatchery is staffed and operated by the Idaho Department of Fish and Game (Department) and is solely funded by IPC. Historical operational data is compiled in Appendix 29-32.

Location

Rapid River Hatchery is located in Idaho County seven miles southwest of the community of Riggins. It lies on Rapid River, a tributary of the Little Salmon River. Travel distance for salmon to the ocean is approximately 600 river miles.

OBJECTIVES

The objectives of Rapid River Hatchery are:

1. To annually produce three million spring chinook salmon smolts. The average size is to be approximately 22.7 g (20 fish/pound). These fish are to be released into Rapid River and the Snake River below Hells Canyon Dam.
2. To trap and spawn adult spring chinook salmon returning to Rapid River.
3. To evaluate various strategies and techniques for rearing spring chinook salmon.
4. To provide eggs and/or fry for supplementation purposes.

FACILITY DESCRIPTION

Fish rearing facilities at Rapid River Hatchery consist of 50 double stack Heath incubators, 12 outdoor concrete raceways (6 ft x 90 ft), and 6 earthen rearing ponds with concrete side walls: Pond 1A and 1B (42 ft x 188 ft each), Pond 2A and 2B (35 ft x 197 ft each), and Pond 2C and 2D (37 ft x 173 ft each). Adult salmon brood stock holding facilities consist of one concrete holding pond (80 ft x 25 ft) and one earthen holding pond (40 ft x 150 ft). This provides space for holding up to 4,000 adult spring chinook salmon prior to spawning. Production capacities by unit are listed in Appendix 1. Rearing space by unit is shown in Appendix 2.

Rapid River Hatchery facilities include a fish trap located on Rapid River approximately 1.5 miles downstream from the hatchery. It is designed to trap and hold upstream migrating adult fish. The trap consists of a permanent wooden velocity barrier, a seven step fish ladder, and a two-stage trap. Adult salmon are transferred from the trap by means of an Alaska Steep Pass Ladder to a

500-gallon bucket operated by an overhead hoist, and then to a 1,000-gallon tank truck for transport to the hatchery. In 1994 the trap facility was modified to allow unimpeded upstream migration of anadromous and resident species around the velocity barrier during periods when trapping operations are not in progress.

As part of our mandate to evaluate production methods we have identified two specific areas where improvement can be made by modifying the existing facility. One relates to adult salmon handling and the other to general hygiene and disease control. The average prespawning mortality at Rapid River Hatchery from 1970 to 1994 is 18.3%. Examination of the prespawning mortality curve (Appendix 41) shows that a sharp increase occurs after first sort and subsequent handling of the adults. Our current method of gathering fish for sorting involves netting all adult fish in a large seine each spawn day. This results in severe handling stress twice a week during spawning season. An improved method for crowding adult fish can have a direct affect on prespawning mortality. This would require facility modification to provide a better environment for holding adult salmon. The other area of improvement involves the way water is supplied to rearing pond number one. All water entering pond one must pass through outdoor raceways. Consequently, we can never dry up the raceway system or disinfect it. All water supplied to ponded fish must pass over fingerlings in the raceways. When the raceways are empty they form a reservoir for the accumulation of bacteria, detritus, and other material. The solution to this problem would be a simple bypass of the raceway system to supply water to the rearing pond.

WATER SUPPLY

Water Source

Rapid River originates in Adams County and flows through an undeveloped canyon before reaching the hatchery. The drainage is protected as part of the Wild and Scenic Rivers Act and is not subjected to perturbations, such as logging, or road building. Rapid River generally provides excellent water for rearing spring chinook salmon however the length and steep nature of the drainage make it a highly variable river. Spring runoff and flash floods can be violent and carry a tremendous volume of silt into the hatchery. High water during the spring of 1994 peaked at 350.8 cfs on May 12. This is very low when compared to 1993 when the spring runoff peaked at 905.3 cfs. The low water provided poorer up-stream migration conditions than in 1993 and may have had something to do with the rather high prespawning mortality (20.75%) for the 1994 salmon run to Rapid River Hatchery. Spring flows in 1994 more closely resembled recent drought years. In winter, flows decline as the upper part of the drainage freezes and ice may block the river. During the winter of 1994-1995 flow in Rapid River declined to 28.0 cfs on January 1, 1995. Another critical period for flow conditions occurs during fish marking (see the Fish Health section). In 1995, marking of brood year 1994 fingerlings occurred during high water. The peak flow occurred on June 18 and was 841.0 cfs. Marking took place from June 27 through 29 when river flows were 570.7 cfs to 672.1 cfs. This relatively high run off was later than normal and the water conditions were turbid. This made water conditions less than optimal for marking. Specific flow information for emigration in the spring of 1996 is not available at this time. Water temperature is also quite variable. The minimum in January is about 34°F and the maximum in August can exceed 60°F. Pond temperatures during adult holding are shown in Appendix 15.

Water Supply

Hatchery water is obtained through one 30-inch and one 24-inch pipeline. A five-foot high wooden diversion dam provides the necessary hydraulic head. Rapid River Hatchery has specific water rights under state license to 28 cubic feet of water per second (cfs) for the hatchery facility and 18.6 cfs for the fish trap. This water is diverted from Rapid River and then returned after passing through the hatchery. Rearing units operate on gravitational flow. Water for the incubation system is pumped from the headrace by one of two 7.5-horsepower electric pumps. A gasoline-operated pump and a gravitational flow filter bed provide water during electrical failures. Water quality parameters are listed in Appendix 3.

STAFFING

Rapid River Hatchery is staffed by three permanent employees, a Fish Hatchery Manager II, an Assistant Fish Hatchery Manager, and a Fish Culturist. Approximately five seasonal employees are hired each year from February through November. The Summer Youth Employee Training Program may provide one or two employees to assist with grounds maintenance. Housing accommodations include three residences for the permanent staff and a 65 ft x 14ft mobile home for seasonal employees.

FISH PRODUCTION

Adult Collection

Spring Chinook Salmon Returns To Rapid River

The Rapid River fish trap operated from March 16 through September 20, 1994. Water conditions were low and presented a greater problem to the fish than to the trapping operation. This year we observed a high number of adult salmon with nitrogen blisters. During trapping operations spring chinook were collected for spawning purposes and transported to holding ponds at the hatchery. Summer chinook, steelhead, and bull trout were also collected and transported above the hatchery intake for release into Rapid River.

The first spring chinook was trapped on May 16 and the last on July 25, 1994. The majority of the run followed a normal curve with a depression during the week of and the week following the tribal fishery (Appendices 4, and 33). The peak of the 1994 run was during the week of June 25 (Appendices 4, and 33). This year, 265 spring-chinook (261 adults and four jacks) were trapped making 1994 the lowest return year recorded at Rapid River Hatchery. Only 29 salmon were received from Oxbow Hatchery. We made the decision to combine holding of the Rapid River returns with adults that returned to the Snake River due to the low numbers. Our holding pond one is concrete, and provides a better environment for holding prior to spawning. We decided the improvement in holding conditions outweighed the statistical problems created by mixing the fish. Lengths are measured at the time of trapping so separate age-class information is available. However, sexual dimorphism does not appear until later in the summer so sex ratios must be for the combined stocks. The sex-ratio of the 294 total fish in holding was 126 adult males (42.86%), 163 females (55.44%), and five jacks (0.1.70%). Polymodal analysis of fork length measurements were used to determine the age-class structure. Age-class composition of the 1994 Rapid River run was 4 (0.1.51%) three-year-olds (0-53 cm), 139 (52.45%) four-year-olds (54-80 cm); and 122 (46.04%) five-year-olds (81 and above cm), (Appendix 5, and 34).

This year no spring chinook, summer chinook, or steelhead were found to have jaw tags. Two spring chinook arrived with radio transmitters placed on them at Ice Harbor Dam. The travel time from Ice Harbor to Rapid River Hatchery was 61 days. In 1994, 18 fish returned with coded-wire tags (CWT). Specific tag recovery data is shown in Appendix 6.

Injuries were documented throughout the trapping season. When multiple injuries were present on the same fish they were recorded separately. Injuries consisted of 36 nitrogen burns, 13 gill net scars, six gaff wounds, and 37 injuries of unknown origin (Appendix 7).

Hells Canyon Spring Chinook Salmon Returns

The spring chinook run to Oxbow Hatchery's Hells Canyon Trap totaled 29 fish. IPC personnel transported them from the Hells Canyon trap to Rapid River Hatchery. The age-class composition of spring chinook in the Hells Canyon run was one - three-year-old (3.5%), 9 four-year-olds (31.0%), and 19 five-year-olds (65.5%). The sex-ratio of the Hells Canyon run is not available because sexual dimorphism is not evident at the time trapping. The sex ratio of the combined Rapid River and Snake River returns was determined during holding at Rapid River Hatchery. For more information see the Oxbow Fish Hatchery Brood Year Report for 1994.

Inventory Of Miscellaneous Species

Summer chinook *O. tshawytscha* were counted from July 18 through September 2, 1994. After July 15, all salmon that were not marked with an adipose fin clip were designated summer chinook. The timing of the summer component of the run is shown in Appendices 8 and 35. This component of the Rapid River run included 23 adults and two jacks. These fish were measured to the nearest centimeter fork length (Appendices 9, and 36), injected with antibiotic, then released above the hatchery into the Rapid River drainage. The age-class composition of this part of the salmon run was 2 three-year-olds (8%), 9 four-year-olds (36%), and 14 five-year-olds (56%). The sex-ratio was 14 adult males (56%), nine females (36%), and two jacks (8%).

From March 21 through May 25, 1994, 43 adult steelhead *O. mykiss* were trapped (Appendix 10, and 37) and measured to the nearest centimeter fork length (Appendix 11, and 38). The steelhead run included 33 wild fish and 10 hatchery fish. The sex-ratio was 12 wild males, 21 wild females, 9 hatchery males, and one hatchery female. Steelhead of hatchery origin were transported back to the Little Salmon River and released approximately one mile upstream from its confluence with Rapid River. Wild steelhead were released into Rapid River upstream from the hatchery intake.

A total of 147 bull trout *Salvelinus confluentus* were trapped from May 24 through August 3, 1994 (Appendices 12, and 39). These fish ranged in size from 29 cm to 53 cm (Appendices 13, and 40). Department researchers continued a study of bull trout movement this year. They conducted habitat surveys and implanted radio transmitters and PIT tags. Periodic radio tracking was used to determine fish movement. Further information regarding this study should be obtained from Dan Schill, at the Department. An inventory of all species trapped in 1994 is shown in Appendix 18.

Harvest Data/Sport And Tribal Fishery

In 1994 there was no sport fishery on the Little Salmon River. There was a Nez-Perce tribal fishery on Rapid River. The tribal fishery started June 3 and went through June 7. The local Department Conservation Officer observed 51 salmon taken in 10 hrs of census. Tribal officials did not report harvest data.

Holding And Spawning

Adult Treatments

Hatchery personnel removed chinook from the trap daily and processed them on site. They were measured, injected, and then transported to the hatchery. All chinook received an intraperitoneal injection of Erythromycin base injectable (Gallimycin 100) at one of two test rates (10 mg/kg or 20 mg/kg). A total of 265 spring chinook (132 at 10 mg/kg and 133 at 20 mg/kg) were injected. All 25 summer chinook were injected at 10 mg/kg. The administration of this antibiotic was performed in accordance with Investigational New Animal Drug (INAD) number 6430.

When they arrived at the hatchery all spring chinook were allocated to holding pond one (HP-1). Hells Canyon returns were also held in HP-1, which provides the most controlled and sanitary environment for holding adult fish due to the concrete walls and floor. This allows for more meticulous care and treatment during holding. This pond is also the only one at Rapid River Hatchery where fish can be collected for sorting and spawning using crowd racks rather than nets. This method is less stressful to the broodstock and provides more accurate data collection. The holding period extended from May 16 to September 18. Formalin treatments were used from May 26 to September 2 control ectoparasites and reduce prespawning mortality. A prophylactic drip treatment regime of 170 ppm formalin for one hour, three times per week was used. During the holding and spawning period, water temperatures ranged from 41° to 64° F (Appendix 15). Carcasses from holding and spawning were hauled to a landfill near Grangeville, Idaho by the Walco Company.

Pre-Spawning Mortality

The combined prespawning mortality for Rapid River and Hells Canyon spring chinook was 61 fish (20.7%). The sex-ratio was 20 adult males (6.8%), 41 females (13.9%). A profile of prespawning mortality (as percent of fish trapped to date) is shown in Appendix 41.

Hatchery personnel performed routine necropsies of all prespawning mortalities. Bacterial Kidney Disease (BKD) related mortality was 12 fish or 4.1% of fish trapped (19.7% of prespawning mortality). Causal factors for prespawning mortality are shown in Appendix 14. Snouts were collected from 24 adipose fin-clipped fish and sent to the Department Fish Marking Laboratory at Lewiston, Idaho, for CWT analysis. The Department lab in Lewiston reported 18 CWTs and six no tags for the 24 snouts taken (Appendix 6).

Spring Chinook Salmon Spawning

In 1994, a total of 116 female spring chinook were spawned from August 15 to September 18, yielding 490,249 eggs. During spawning, an additional six females were destroyed

and their eggs discarded for the following reasons: poor egg quality, premature egg development, spawn out, bloody ovarian fluid, or gross symptoms of BKD. Each female was sampled during spawning for BKD analysis. We followed standard Department split random cross protocol. Females were killed with a blow to the head. Eggs from single females were put into a colander to drain off the ovarian fluid prior to fertilization, then transferred to two buckets, fertilized with the milt from two males, and mixed with approximately 250 ml of well water to activate the sperm. Jacks were included at random for fertilization throughout the spawning season. All fertilized eggs were water hardened for 30 minutes in a minimum of 100 ppm Argentyne. After water hardening, eggs to be incubated at Rapid River Hatchery were placed in Heath vertical stack incubators. Complete egg enumeration and disposition data is compiled in Appendix 16.

Incubation

Eggs were incubated at a rate of one female per tray to allow segregation of individual fish pending results from Enzyme-linked Immunosorbant Assay (ELISA) studies.

The total egg take for 1994 was 490,249 eggs from 116 females. This yields a fecundity of 4,226 eggs per female. After primary pick off of 45,176 bad eggs 445,073 eyed eggs remained. This is an overall eye-up of 90.7%.

In 1994, 58,791 eyed eggs from 67,170 green eggs produced by 16 females tested disease-positive were transferred to Department's Clearwater Fish Hatchery for isolated incubation. The eggs were transferred in EggTUBE containers manufactured by the AquaSeed Corporation. EggTUBEs were placed in EggBOX coolers and transported by Rapid River Hatchery personnel. The results of ELISA titers are shown in Appendix 17. This group of eggs had an eye-up of 87.5% and a fecundity of 4,198 for the 16 females.

Approximately 386,282 eyed eggs were retained at Rapid River Hatchery. These came 423,079 green eggs from 100 females. Eye-up for this group was 91.3% and fecundity was 4,231 for the 100 females. Incubation temperature ranged from 35°F to 59°F, and flow was set to six g.p.m. Incubation commenced on August 15 when the first female was spawned and lasted through February 24 when the last lot was ponded.

The eggs that remained at Rapid River Hatchery were shocked at 500 DTUs (Daily Temperature Units) by pouring them from the trays into water and back into trays. They were picked two days later using the salt bath method. At this time a Jensorter egg counter was used to establish inventory numbers. After counting the eggs were returned to clean trays. At 1,000 DTUs when most of the eyed eggs had hatched the trays were picked again and a third pick off was done just prior to ponding. Second and third picking removed 10,894 additional eggs. This left an inventory of 375,388 to start brood year 1994 (based Jensorter count). All trays were "rodded" weekly, after eye-up, to remove silt. Three days each week, formalin was administered to each incubator stack at a rate of 1,667 ppm (1:600) for 15 minutes to retard external *mycosis*. This procedure was discontinued after each egg "Lot" accumulated 800 DTUs. *Mycosis* was successfully controlled. Fry were ponded at approximately 1750 DTUs with a survival to swim-up of 88.7% from the 423,079 green eggs incubated at Rapid River Hatchery (Appendix 27).

Early Rearing

From November 27 through February 24, 1994, fry were ponded. Initially the first lots were placed in indoor vats then all fry were moved from the incubation building to four outdoor raceways. Fry that came from females which tested BKD positive were kept separate from their cohorts. The average size at transfer was 0.33 g (1,385 fish per pound). Average initial loading density was 72,117 to 123,844 fish per raceway yielding an average density index of 0.24 (Appendix 19). Initial water depth was 1.5 feet and water flow was adjusted to 270 g.p.m. As the fish increased in size, water depth and flows were increased to a maximum depth of three feet and flow of 850 g.p.m.. Density and flow indices (Piper, et al., 1982) were maintained below 0.3 and 1.0 respectively, throughout the initial rearing period. The fry increased in size to an average length of 75.2 mm and weight of 3.71 g (122.5 fish per pound) during early rearing. Mortality during early rearing from ponding to marking and transfer at the end of June was 5,412 fish or 1.4%.

At the end of the early rearing period the fish were marked (see Fish Marking) and transferred to rearing ponds. Immediately after marking all 1994 brood year fingerlings were fed 2.5% Aquamycin, at a rate to provide a dose of 100 mg Erythromycin per kilogram body weight, per day, for 21 days. This treatment was followed by appropriate toxicity testing and was performed according to guidelines set forth in INAD number 4333.

Final Rearing

Rearing ponds were disinfected with a 200 ppm chlorine bath prior to ponding fish. As in the past hatchery inventory numbers were adjusted by actual count obtained as fish were marked and transferred into the final rearing ponds. The fingerlings were transferred from raceways to ponds through four inch irrigation pipe. Fry that came from BKD positive females were moved to Rearing Pond 1B and fry from BKD negative females were moved to Rearing Pond 2A. The marking crew reported a total of 379,865 spring chinook were marked and moved from June 27 through June 29, 1995. This is an increase of 2.6% over hatchery inventory. This number is used for inventory for the final rearing period. Initial pond loading densities are reported in Appendix 20. Fingerlings were ponded at a mean length of 75.2 mm and increased to 141.5 mm at release. Final rearing densities prior to the initiation of volitional release on March 19, 1996 are shown in Appendix 21.

Starting August 30, 1995 all fingerlings were fed a second treatment of 2.5% Aquamycin for 21 days. Again this was fed to provide a dose of 100 mg per kilogram body weight of Erythromycin, per day. This treatment was performed in accordance with INAD number 4333.

Feed Use And Conversion Data

A total of 2,954 lbs of feed was used during the initial rearing period with a feed conversion of 1.04. A total of 29,277 lbs. of feed were fed during the final rearing period with a feed conversion of 1.50 lbs of feed for each pound increase in biomass. A total of 30,200 pounds of BioProducts feed was used for 1994 brood year fish prior to the beginning of volitional release on March 19. The overall feed conversion for 1994 brood year spring chinook was 1.35. This number is based on inventory and fish size on March 19. Between March 19 and egress of the last fish on April 16 another 2,031 lbs was fed to maintain vigor and visceral fat. This yields 32,231 lbs total feed, however conversion based on this number would be meaningless due to lack of specific inventory information for the period between March 19 and April 16. We feel that the value of volitional release far exceeds the need for increased precision of conversion data. Specific data on feed types and sizes used are listed in Appendix 22.

Fish Health

Diseases Encountered And Treatment

This part of the 1994 Brood Year Report is reproduced with permission from written communication with Mr. Doug Munson of the Department at the Eagle Fish Health Laboratory in Eagle Idaho. The summary of the pre-liberation inspection was reduced from the routine Fish Health Inspection Report for March 16, 1996 accession number 96-080. A summary of Eagle Health Laboratory results for inspections of brood year 1993 brood stock and juveniles is shown in Appendix 24.

Fish health was exceptional for this rearing cycle. Disease at Rapid River Hatchery was not a problem during this past year and common etiologic agents such as *Renibacterium* (via DFAT), *Flexibacter psychrophilus*, and EIBS have not been detected during normal inspection sampling. *Renibacterium* was detected at pre-liberation via ELISA (enzyme linked immuno-sorbent assay) technology.

Two prophylactic erythromycin feed treatments were applied for 21 days apiece, to control *Renibacterium*.

Pre-liberation Inspection

Twenty fish were sampled on March 16, 1996. The results of this inspection were:

1. 2/4 pools positive for BKD (ELISA)- All pools low optical density and all pools negative via DFAT.
2. 0/20 positive for *Myxobolus*.
3. 0/20 fish positive for IHN
4. 0/20 fish positive for IP.
5. 0/20 positive for EIBS. In addition to the inspection results from this sample Organosomatic indices is provided in Appendix 23 (Goede, R. W. and S. Houghton. 1987).

Acute Losses

Acute and chronic losses were not experienced at Rapid River Hatchery this year.

Other Assessments

These fish were analyzed for Erythrocytic Inclusion Body Syndrome (EIBS) and all samples were negative. Fish were also examined for *Myxobolus cerebralis*. *Myxobolus* spores were found by digestion methods, but *M. cerebralis* could not be confirmed through histological techniques. Thus Rapid River Hatchery remains negative for whirling disease.

"Fuzzy tail" (external *mycosis*) has not been observed at this hatchery in two rearing years. Implementation of a BKD segregation/culling program and proper scheduling of marking have been crucial in elimination this *mycotic* problem. In past years, routine inspection sampling correlated the rise in incidence of BKD and *Flexibacter* to the onset of external mycosis. Recently, the hatchery crew has observed that during high run-off and heavy sediment loads, there seems to be an increase in fuzzy-tails. Furthermore, if marking is done during these run-off periods, fuzzy-tail is exacerbated. Even though fuzzy-tail had been a problem at this hatchery before clipping was mandated, proper scheduling has certainly been a boost to fish health at this station.

In the future, we will continue to implement BKD segregation/culling to maintain fish health at this facility and also begin implementation of a high BKD rearing strategy. Working in close contact with the hatchery crew, we expect to improve the fish health at this facility.

In addition to Department inspection, federal personnel from the U.S. Department of the Interior National Biological Service sampled 20 fish at Rapid River Hatchery on March 14, 1996 for analysis by the Columbia River Research Laboratory (CRRL) in Cook, Washington. For more information on the results of their studies contact Mr. Philip Haner or Mr. Alec Maule at CRRL, Cook Washington.

Fish Marking

Fish marking protocol requires the adipose fin to be removed from all brood year 1994 hatchery-reared salmon. The marking crew reported that a total of 379,865 fish were adipose clipped. Coded-wire tags were placed in 65,628 fingerlings. Marking continued from June 27 to June 29, 1995. PIT tags were placed in 2,006 fish February 28 through March 1, 1996. These fish were released into Rapid River April 2-5, 1996 during the peak of volitional release. PIT tags were also placed in an additional 17,185 fish from March 14-15, 1996. These fish were released volitionally from March 19 through April 16. Specific marking information is presented in Appendix 25. For more information regarding marking consult the Annual Release Summary Of Marked Salmon And Steelhead published by Department.

Fish Distribution

Egg Transfers

During 1994, 58,791 eyed from 16 females were transferred to Clearwater Hatchery for isolated incubation and rearing. Smolts from these eggs were released into the Snake River by Clearwater Hatchery in 1996. For more information contact the Department Clearwater Hatchery.

Fingerling Transfers

No brood year 1994 fingerlings were transferred.

Smolt Releases

The total release of brood year 1994 spring chinook from Rapid River Hatchery was 379,167 fish (22,605 pounds). All brood year 1994 smolts at Rapid River Hatchery were released into Rapid River. Survival from marking to release was 99.8%. All releases took place from March 19 through April 16, 1996. Total cost of production for Brood Year 1993 smolts was \$400,147.52 or \$2.28 per pound of fish released (Appendix 28).

Volitional smolt releases from Rapid River Hatchery began on March 19, 1996 when approval was granted by the National Marine Fisheries Service. Smolts averaged 27.0 g (16.8 fish per pound) and 141 mm fork length. Rearing Densities for smolts at time of release are listed in Appendix 21. Based on visual observations, it is estimated that over 99% of the smolts migrated volitionally. The remaining few fish were netted from the ponds as they were dewatered. The last fish emigrated on April 16. Release data is reported in Appendix 26.

ACKNOWLEDGMENTS

The crew at Rapid River Hatchery would like to thank Paul Abbott and the entire fisheries staff at IPC for their support and assistance in helping us to maintain and improve the hatchery facility. We would also like to thank personnel from other Department hatcheries who helped us take eggs during the spawning season. Our gratitude goes to Roy Kinner and other Department conservation officers for helping with enforcement at the hatchery and for security at the trapping facility. In addition, we extend our appreciation to Doug Munson and the Eagle Fish Health Lab staff for disease diagnostic work at the hatchery, and assistance with preparation of this document. This team effort helps to keep Rapid River a successful hatchery.

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APPENDICES

Appendix 1. Rapid River Hatchery Production Capacity.

Rearing unit	Volume	Carrying capacity
Incubators	800 trays	3,200,000 eggs
Raceways (12)	1,890 cubic ft	3,800,000 fry
Rearing Pond #1	54,625 cubic ft	1,000,000 smolts
Rearing Pond #2	92,827 cubic ft	2,000,000 smolts
Adult Holding Pond 1	12,000 cubic ft	1,000 adults
Adult Holding Pond 2	24,000 cubic ft	3,000 adults

Appendix 2. Rapid River Hatchery Pond Volume.

Rearing/holding area	Volume (cubic ft)
Rearing pond 1A	27,496
Rearing pond 1B	27,129
Rearing pond 2A	23,858
Rearing pond 2B	22,607
Rearing pond 2C	22,468
Rearing pond 2D	23,894
Adult holding pond 1	12,000
Adult holding pond 2	24,000

Appendix 3. Rapid River Water Quality Analysis, February 1996.

Analyte	PQL	Result	Units
Nitrate/N	0.05	ND	mg/L
Nitrite	0.05	ND	mg/L
Sulfate	1	14	mg/l
Orthophosphate/P	0.05	ND	mg/L
Ammonia/N	0.5	ND	mg/L
Alkalinity	10	74	mg/L as CaCO ₃
Hardness	10	80	mg/L as CaCO ₄
pH		7.63	
Hydrogen Sulfide	0.2	ND	mg/L
Chlorine	0.1	ND	mg/L
Arsenic	1	ND	ug/L
Cadmium	1	ND	ug/L
Chromium	1	ND	ug/L
Mercury	1	ND	ug/L
Lead	1	ND	ug/L
Selenium	1	ND	ug/L
Silver	1	ND	ug/L
Iron	30	120	ug/L
Zinc	1	51	ug/L
Cooper	1	ND	ug/L
Aldrin	0.1	ND	ug/L
Endrin	0.1	ND	ug/L
Dieldrin	0.1	ND	ug/L
Heptachlor	0.1	ND	ug/L
Chlordane	0.1	ND	ug/L
Methoxychlor	0.1	ND	ug/L
Lindane	0.1	ND	ug/L
Guthion	0.1	ND	ug/L
Malathion	0.1	ND	ug/L

PQL= practical Quantitation Limit
 ND = not detected(<PQL)

Appendix 4. Rapid River Spring Chinook Run Timing, 1994.

Week ending	Number of fish	Percent of total run
May 14	0	0.0
May 21	5	1.9
May 28	11	4.2
June 4	32	12.1
June 11	32	12.1
June 18	29	10.9
June 25	73	27.5
July 2	46	17.4
July 9	23	8.7
July 16	13	4.9
July 23	0	0.0
July 30	1	0.4
August 6	0	0.0
August 13	0	0.0
August 20	0	0.0
August 27	0	0.0
Total	265	100.0

Appendix 5. Rapid River Spring Chinook Length Frequency, 1994.

Fork Length (cm)	Number of fish	Fork Length (cm)	Number of fish
Less than 40	1	80	10
40	0	81	11
41	0	82	9
42	1	83	15
43	0	84	16
44	0	85	14
45	1	86	10
46	0	87	6
47	1	88	12
48	0	89	6
49	0	90	7
50	0	91	6
51	0	92	3
52	0	>92	7
53	0	total run	265
54	0		
55	0		
56	0		
57	0	Sex composition data	
58	0	5 (1.70%) jacks	
59	2	126 (42.86%) males	
60	0	163 (55.44%) females	
61	0	294 (100.00%) *total	
62	0		
63	2		
64	0		
65	1		
66	0	Age-class data	
67	2	4 (1.15%) three-year-old	
68	7	139 (52.45%) four-year-old	
69	4	122 (46.04%) five-year-old	
70	11	265 (100.00%) total	
71	12		
72	9		
73	14	Age-class criteria	
74	13	0 – 53 cm = three-year-old	
75	12	54 – 80 cm = four-year-old	
76	16	80 - > = five-year-old	
77	9		
78	5		
79	10		

*The sex ratio includes 29 fish received from Oxbow Hatchery.

Appendix 6. Marked Adult Recapture, 1994 at Rapid River Fish Hatchery.

Recapture date	species	Fork length (cm)	CWT number	Radio CH/Code	Comments
6-21-94	chinook	81		2/3	inserted at Ice Harbor on 4-21-94
6-19-94	chinook	84		3/3	inserted at Ice Harbor on 4-20-94
1994	chinook	92	10-34-05		male
1994	chinook	87	10-34-08		female
1994	chinook	71	10-35-01		female
1994	chinook	87	10-34-08		male
1994	chinook	82	10-34-15		male
1994	chinook	88	10-34-13		male
1994	chinook	78	10-34-01		male
1994	chinook	77	10-35-02		female
1994	chinook	91	10-34-05		male
1994	chinook	70	10-35-01		female
1994	chinook	81	10-34-09		female
1994	chinook	65	10-34-05		female
1994	chinook	97	10-34-10		male
1994	chinook	89	10-34-14		male
1994	chinook	42	10-49-09		male
1994	chinook	46	blank wire		male
1994	chinook	72	10-34-09		male

24 snouts were collected and sent to the Department Fish Marking Lab in Lewiston, Idaho. 18 of these had CWT and 6 had no tag.

Appendix 7. Injuries to Adult Chinook Returning to Rapid River, 1994.

Strain	Gaff Wound	Nitrogen blister	Gill net	Other injuries
Spring	6	36	13	37
Summer	0	5	0	0

Appendix 8. Rapid River Summer Chinook Run Timing, 1994.

Week ending	Number of fish	Percentage of run
July 2	0	0.0
July 9	0	0.0
July 16	0	0.0
July 23	2	8.0
July 30	8	32.0
August 6	3	12.0
August 13	0	0.0
August 20	6	24.0
August 27	4	16.0
September 3	2	8.0
total	25	100.0

Appendix 9. Rapid River Summer Chinook Length Frequency, 1994.

Fork Length (cm)	Number of fish	Fork Length (cm)	Number of fish
less than 40	0	80	0
40	0	81	1
41	0	82	2
42	0	83	1
43	1	84	0
44	0	85	2
45	0	86	1
46	0	87	1
47	1	88	2
48	0	89	0
49	0	90	1
50	0	91	1
51	0	92	0
52	0	>92	2
53	0	total run	25
54	0		
55	0		
56	0		
57	0		
58	0	Sex composition data	
59	2	2 (18.0%) jacks	
60	0	14 (56.00%) males	
61	0	9 (36.00%) females	
62	0	25 (100.00%) *total	
63	0		
64	0		
65	0		
66	1	Age-class data	
67	0	2 (18.00%) three-year-old	
68	0	9 (36.00%) four-year-old	
69	0	14 (56.00%) five-year-old	
70	0	25 (100.00%) total	
71	0		
72	2		
73	2	Age-class criteria	
74	3	0 – 53 cm = three-year-old	
75	0	54 – 80 cm = four-year-old	
76	0	80 - > = five-year-old	
77	0		
78	1		
79	0		

Appendix 10. Rapid River Steelhead Run Timing, 1994.

Week ending	Number of fish	Percentage of run
March 19	0	0.0
March 26	1	2.3
April 2	2	4.7
April 9	5	11.6
April 16	5	11.6
April 23	10	23.3
April 30	4	9.3
May 7	7	16.3
May 14	5	11.6
May 21	2	4.7
May 28	2	4.7
June 4	0	0.0
total	43	100.0

Appendix 11. Rapid River Steelhead Length Frequency, 1994.

Fork length (cm)	Hatchery		Wild	
	Male	Female	Male	Female
51				
52				
53				1
54				
55				
56	1			
57				
58			1	
59	1			
60	1			
61	1		2	1
62				1
63	1			1
64			1	1
65				
66				1
67			1	
68	1		1	
69			1	
70			1	
71		1		1
72	1			
73	1			7
74				2
75	1			
76			1	
77				2
78			1	3
79				
80				
81				
82				
83				
84				
85			2	
86				
87				
88				
89				
column total	9	1	12	21
origin total		10		33
total run			43	

Appendix 12. Rapid River Bull Trout Run Timing, 1994.

Week ending	Number of fish	Percentage of run
May 28	13	8.8
June 4	18	12.2
June 11	30	20.4
June 18	34	23.1
June 25	21	14.3
July 2	20	13.6
July 9	3	2.0
July 16	3	2.0
July 23	0	0.0
July 30	2	1.4
August 6	3	2.0
August 13	0	0.0
August 20	0	0.0
August 27	<u>0</u>	<u>0.0</u>
Total	147	100.0

Appendix 13. Rapid River Bull Trout Length Frequency, 1994.

Total length (cm)	Number of fish	Total length (cm)	Number of fish
21	0	41	14
22	0	42	14
23	0	43	14
24	0	44	11
25	0	45	17
26	0	46	0
27	0	47	6
28	0	48	4
29	2	49	2
30	1	50	3
31	0	51	2
32	0	52	2
33	2	53	1
34	1	54	0
35	5	55	0
36	8	56	0
37	3	57	0
38	9	58	0
39	11	59	0
40	15	60	0
Total			147

Appendix 14. Major Causes of Pre-Spawning Adult Mortality, 1994 at Rapid River Hatchery.

Cause	Number of fish	Percent of fish held
unknown	17	5.8
BKD	12	4.1
jaundice	1	0.3
nitrogen burn	30	10.2
wounds	1	0.3
total	61	20.7

Appendix 15. Monthly Adult Holding Pond Temperatures, 1994 at Rapid River Hatchery.

Month	Maximum	Minimum	Average
April	54	41	46.4
May	54	44	48.2
June	60	45	52.2
July	64	51	57.1
August	63	54	58.2
September	58	50	54.5

Appendix 16. Rapid River Hatchery Egg Enumeration Data, 1994.

Total Eggs Taken at Rapid River Hatchery in 1994.

Lot	Eyed	Bad	Green	Percent eyed	Average fecundity	Females
R1	3,638	403	4,041	90.0	4,041	1
R2	30,088	4,018	34,106	88.2	4,872	7
R3	37,308	3,214	40,522	92.1	4,052	10
R4	63,399	3,768	67,167	94.4	4,798	14
R5	102,504	5,676	108,180	94.7	4,327	25
R6	171,220	19,226	190,446	89.9	4,140	46
R7	32,170	4,098	36,268	88.7	3,627	10
R8	4,291	2,710	7,001	61.3	3,501	2
R9	455	2,063	2,518	18.1	2,518	1
total	445,073	45,176	490,249	90.7	4,226	116

Eggs Transferred to Clearwater Hatchery from Rapid River, 1994. Hatchery in 1994.

Lot	Eyed	Bad	Green	Percent eyed	Average fecundity	Females
R2	5,261	670	5,931	88.7	4,261	1
R3	7,543	224	7,767	97.1	3,883	2
R4	3,717	61	3,778	98.4	3,778	1
R5	14,887	330	15,217	81.0	5,072	3
R6	20,181	4,686	24,867	80.0	4,145	6
R7	4,414	1,087	5,501	67.9	2,751	2
R8	2,788	1,321	4,109	67.9	4,109	1
total	58,791	8,379	67,170	87.5	4,198	16

Eggs Retained at Rapid River Hatchery in 1994.

Lot	Eyed	Bad	Green	Percent eyed	Average fecundity	Females
R1	3,638	403	4,041	90.0	4,041	1
R2	24,827	3,348	28,175	88.1	4,696	6
R3	29,765	2,990	32,755	90.9	4,094	8
R4	59,682	3,707	63,389	94.1	4,876	13
R5	87,617	5,346	92,963	94.2	4,226	22
R6	151,039	14,540	165,579	91.2	4,139	40
R7	27,756	3,011	30,767	90.2	3,846	8
R8	1,503	1,389	2,892	52.0	2,892	1
R9	455	2,063	2,518	18.1	2,518	1
total	386,282	36,797	423,079	91.3	4,231	100

Appendix 17. ELISA Results, Rapid River Hatchery Brood Stock, 1994.

Lot number	Date sampled	Number sampled	Negative	Positive		
			<0.99	Low .1-.25	Moderate .26-.59	High >.60
RI	8/15	1	1			
R2	8/18	2	2			
R3	8/23	7	4	2		1
R4	8/25	10	6	2		2
R5	8/29	15	12	2		1
R6	9/01	29	12	11	1	5
R7	9/06	46	26	9	5	6
R8	9/08	10	3	5		2
R9	9/15	3		2		1
total		123	66	33	6	18

Appendix 18. Species Trapped in Rapid River, 1994.

Species	Number trapped
spring chinook	265
summer chinook	25
steelhead	43
bull trout	147

Appendix 19. Initial Raceway Loading Densities, February 1995 at Rapid River Hatchery.

Raceway	Inflow (cfs)	Number of fish	Fish per pound	Density index	*Flow index
2	.48	123,844	569.7	0.26	0.57
3	.48	90,748	765.7	0.24	0.35
4	.48	72,117	597.3	0.22	0.32
5	.48	84,466	814.59	0.21	0.31

Permissible maximum flow index for February 1995 was 2.42.

Appendix 20. Initial Pond Loading Densities, June 1995.

Pond	Inflow (cfs)	Number of fish	Fish per pound	Density index	Flow index
Pond 1B	3.22	171,975	137.9	0.01	0.30
Pond 2A	4.81	207,890	111.6	0.02	0.29

Permissible maximum flow index for June 1995 was 2.09.

Appendix 21. Pond Loading Densities at Release, March 1996.

Pond	Inflow (cfs)	Number of fish	Fish per pound	Density index	Flow index
Pond 1A	7.34	17,185	18.0	0.006	0.05
Pond 1B	6.48	153,417	18.0	0.067	0.53
Pond 2A	7.93	206,564	15.8	0.099	0.66
Raceway 10	0.28	1,002	15.8	0.03	0.08
Raceway 11	0.28	999	18.8	0.03	0.09

Permissible maximum flow index for March 1996 was 2.52 for 40°F at 2188' ASL.

Appendix 22. Feed Used at Rapid River Hatchery For Brood Year 1994.

Product		Amount Used	Unit price	Total Cost
Type/size	Additives			
BioDiet:				
No. 2 Starter		80.0 kg	1.9200	153.60
NO. 3 Starter		120.0 kg	1.9200	230.40
1.0 mm Grower		300.0 kg	1.5400	462.00
1.3 mm Grower		360.0 kg	1.4500	522.00
1.5 mm Grower		480.0 kg	1.4500	696.00
total for early rearing		1,340.0 kg		2,064.00
		2,954.0 lb		
BioMoist				
2.5 mm Feed	*EIBS vitamin pac	5,300.0 lb	0.4750	2,517.50
2.5 mm Feed	2.25% Aquamycin-	1,700.0 lb	0.8013	1,362.21
3.0 mm Feed	EIBS vitamin pac	15,000.0 lb	0.4750	7,125.00
3.0 mm Feed	EIBS vitamin pac	3,833. lb	0.4900	1,878.17
3.0 mm Feed	2.25% Aquamycin-	3,400.0	0.8013	2,724.41
BioDiet				
3.0 mm Feed		44.0	0.6090	26.80
total for final rearing		29,277.0 lb		15,634.09
total for brood year 1994		32,231.0 lb		17,698.09

EIBS vitamin pac: 5 x C and B12, and 10 x Folic Acid

Appendix 23. Pre-Liberation Organosomatic Index, Brood Year 1994 for Rapid River Hatchery.

Hematology						
Date	Hematocrit			Serum protein		
	^a Mean	^b SD	^c CF	^a Mean	^b SD	^c CF
03/14/96	45.35	4.61	10.14	6.58	1.62	24.6

^a20 fish pool

^bStandard deviation

^cCoefficient of variation

Combined autopsy summary

Eyes		Gills		Pseudo- branches	Thymus	Mesn. fat	Spleen	Hind gut	Kidney	Liver	Bile
N	20	N	20	N	20	0	0	B	0	0	20
B1	0	F	0	S	0	1	1	R	20	1	0
B2	0	L	0	L	0	2	9	G	0	2	0
E1	0	C	0	S&L	0	3	5	NO	0	G	0
E2	0	M	0	I	0	4	5	E	0	U	0
H1	0	P	0	OT	0			OT	0	OT	0
H2	0	OT	0	O	0					OT	0
M1	0										
M2	0										
OT	0										

Summary of normals

20	20	20	20	20	20	20	20	20	20	20	0
----	----	----	----	----	----	----	----	----	----	----	---

N= normal

F= frayed

OT= other

Thymus: 0= no hemorrhage

Mesenteric fat: 0= none, 1= <50% coverage, 2= 50%, 3= >50%, 4= 100%

Spleen: R= red, E= enlarged (EIBS enlarges spleens)

Hind gut: 0= no inflammation

Liver: B= pail red

Bile: 0= yellow bile <full bladder

Appendix 24. The Eagle Fish Health Laboratory Inspection Results for Brood Year 1994 at Rapid River Hatchery.

	Brood Year	Log Stock	Log Number	IHN	IPN	EIBS	BKD	FUR	ERM	CWD	WHD	CSH	Comments
<u>Juvenile samples</u>													
	94RRSC		95-010	-	-	-	-	-	-	-			No pathogens detected; VIRO 0/10, FA 0/10, BACTE NSG
	94RRSC		95-070	-	-								No pathogens detected; VIRO 0/19
	94RRSC		95-311	-	-		-						No pathogens detected; VIRO 0/10, FA 0/10
	94RRSC		95-352	-	-		-						No pathogens detected; VIRO 0/10, FA 0/10
	94RRSC		95-429	-	-		-	-	-	-			No pathogens detected; VIRO 0/10, DFAT 0/10,
	94RRSC		95-493	-	-		-	-	-	-	-		Over eating aquatic insects; FAT 0/8, WHD 0/13,
	94RRSC		96-001	-	-	-	-	-	-	-			Open case; FAT 0/20, VIRO 0/20, EIBS 0/20, BACTE NSG
31	94RRSC		96-043										Open case;
<u>Brood samples</u>													
	RRSC		94-389	-	-		-				-	-	Negative for pathogens; WHD 0/1, C. SHASTA 0/1, ELISA 0/1, VIRO 0/1
	RRSC		94-404	+	-		-				-	-	IX: IHNV; WHD 0/2, CSH 0/2, IHN %, IPN 0/2, ELISA 0/2
	RRSC		94-405			-	-				-	-	IX: Negative for pathogens; FA 0/10, EIBS 0/10
	RRSC		94-415	-	-		+				-	-	IX: BKD; C.SHASTA 0/7, VIRO 0/7, ELISA 3/7 (1 HIGH, 2 LOW), WHD 0/7
	RRSC		94-423	+	-		+				-	+	IX: IHNV; BKD; CSH; ELISA 4/10(2 LOW, 2 HIGH), WHD 0/10, IHN 1/10, IPN 0/10, C.SHASTA 2/2 (5 FISH POOLS) MODERATE/HVY
	RRSC		94-433	-	-		+				-	-	IX: BKD, ELISA 3/15 (1 HIGH, 2 LOW), VIRO 0/14, WHD 0/15, CSH 0/10
	RRSC		94-448	+	-		+						IX: IHNV, BKD, ELISA 17/29 (11 LOW, 1 MOD, 5 HIGH), IHN 7/20, IPN 0/20, MFAT 19/29
	RRSC		94-455				+						IX: BKD; ELISA 20/46 96 HIGH, 5 MOD, 9 LOW)
	RRSC		94-458				+						IX: BKD; ELISA 7/10 (5 LOW, 2 HIGH)
	RRSC		94-494				+						IX: BKD; ELISA 3/3 (1 HIGH, 2 LOW)

Appendix 25. Rapid River Hatchery Marking Summary, Brood Year 1994.

Coded-wire Tag Releases							
Release site	Date released	Marked fish released	Release group mark code	Clip	Purpose	Pond	Study number
Rapid River	3/19-4/16/96	22,236	10/45/01	Ad	U.S. Canada	1B	96RR-01
Rapid River	3/19-4/16/96	149,368	Ad only	Ad	Hatchery evaluation	1B	96RR-02
Rapid River	3/19-4/16/96	43,276	10/20/20	Ad	U.S. Canada	2A	96RR-01
Rapid River	3/19-4/16/96	164,287	Ad only	Ad	Hatchery evaluation	2A	96RR-02
total site release		379,167					
total hatchery release		379,167					

Pit Tag Releases							
Release site	Date released	Marked fish released	Release group mark code	Clip	Purpose	Pond	Pit tag file number
Rapid River	4/2/96	500	10/45/01 or ad only	Ad	FPC	1B	LRB96060.RR1
Rapid River	4/3/96	499	10/45/01 or ad only	Ad	FPC	1B	LRB96061.RR2
Rapid River	4/4/96	498	10/20/20 or ad only	Ad	FPC	2A	LRB96061.RR3
Rapid River	4/4/96	504	10/20/20 or ad only	Ad	FPC	2A	LRB96061.RR4
Rapid River	3/19-4/16/96	1,700	10/45/01 or Ad only	Ad	Migration study	1A	DAC96074.R11
Rapid River	"	1,700	"	Ad	"		DAC96074.R12
Rapid River	"	382	"	Ad	"		DAC96074.R13
Rapid River	"	2,223	"	Ad	"		DAC96074.R14
Rapid River	"	1,700	"	Ad	"		DAC96074.R21
Rapid River	"	788	"	Ad	"		DAC96074.R22
Rapid River	"	1,643	"	Ad	"		DAC96074.R23
Rapid River	"	737	"	Ad	"		DAC96074.R31
Rapid River	"	2,355	"	Ad	"		DAC96074.R32
Rapid River	"	805	"	Ad	"		DAC96074.R41
Rapid River	"	2,553	"	Ad	"		DAC96074.R42
Rapid River	"	400	"	Ad	"		DAC96075.R15
Rapid River	"	199	"	Ad	"		DAC96075.R15

Appendix 26. Smolts Released from Rapid River Hatchery in 1996 (Brood Year 1994).

Release Site Date	Release Method	Number Released	Number of Fish Per Pound
Rapid River			
3/19-4/16/96	Volitional release pond 1A	16,910	18.0
3/19-4/16/96	Volitional release pond 1B	153,287	18.0
3/19-4/16/96	Volitional release pond 2A	206,234	15.8
4/4-5/96	Pit release raceway 10	1,002	18.0
4/2-3-96	Pit release raceway 11	999	15.8
	Volitional release subtotal	378,432	16.8
4/16/96	Smolts flushed pond 1A	275	18.0
4/16/96	Smolts flushed pond 1B	130	18.0
4/16/96	Smolts flushed pond 2A	330	15.8
	Pond flush subtotal	735	16.8
Site total	number released	379,167	16.8
Hatchery total	number released	379,167	16.8
	pounds released	22,605	

Appendix 27. Brood Year 1994 Survival from Eggs to Smolts at Rapid River Hatchery.

^a Green eggs	Eyed egg number	Percent survival	Swim up	^b Percent survival	^c Marked number	Released smolts	^d Percent survival
423,079	386,282	91.3	375,388	88.7	379,865	379,167	99.8

^aTotal green eggs after transfer or of 67,170 green eggs to Clearwater Hatchery.

^bPercent survival from green eggs to swim-up.

^cThe reported number marked was 2.6% over hatchery inventory at the time of marking.

^dPercent survival from marking to release.

Appendix 28. Rapid River Hatchery Brood Year 1994 Cost of Production.

Number of fish	Pounds of fish	Pounds of feed	Cost of feed	^a Feed conversion	^b Total cost	Cost per thousand	Cost per pound
379,167	22,605	32,231	\$17,698.09	1.42	\$675,235.96	\$1780.84	\$29.87

^aThis number for feed conversion is based on total feed used which may be misleading biologically. Actual pounds of fish released is based on sampling conducted on March 19. Between March 19 and April 16 an additional 2,031 lbs of feed was used. The conversion based on feed used to produce the sampled weight was 1.35 pounds of feed per pound of weight gain.

^b The figure \$675,235.96 was submitted to us at Rapid River Hatchery by Paul Abbott (IPC Hatchery Biologist) in his memo dated 6/25/96. This figure is for "total cost paid by IPC from 9/1/94 through 3/30/96". This covers a nineteen month period. During this time Brood Year 1994 fish shared funding with Brood Years 1993, or 1995 for fourteen of the nineteen months. This method of calculation counts the same total cost twice for the fourteen months reported again in reports for Brood Year 1993 (9/1/94-3/30/95), and Brood Year 1995 (9/1/95-3/30/96). This makes cost of production numbers misleading. In addition, these costs include funds provided to Department by IPC, as well as internal costs incurred by IPC that are beyond the control of the Department. These additional costs may or may not be directly related to fish production, e.g. IPC shop costs, or administrative overhead.

Appendix 29. Returns to Rapid River Hatchery, 1964-1995.

Return year	Snake R. return (adults)	Rapid R. return (adults)	Rapid R. return (Jacks)	Percent prespawning mortality	Females spawned	Eggs/ female	Number of eggs taken
1964	349			16	182	4,874	887,000
1965	408			21	133	4,541	604,000
1966	1,511			18	621	3,697	2,296,000
1967	974	1,039		11	581	3,537	2,055,000
1968	351	3,416	740	2	1,809	3,671	6,540,000
1969	672	2,817	1,043	8	1,415	3,655	5,151,697
1970		6,470	887	10	3,520	4,136	14,560,280
1971		3,357	1,754	19	1,722	3,507	6,038,785
1972		12,310	943	15	3,825	3,941	15,072,604
1973		17,054	286	37	3,454	3,912	13,510,465
1974		3,457	538	27	1,756	3,924	6,890,186
1975		4,428	573	7	2,184	3,894	8,503,606
1976		6,342	1,765	15	3,055	3,762	11,492,878
1977		7,767	437	11	3,781	3,745	14,160,330
1978		5,735	34	21	2,350	4,266	10,026,888
1979		3,054	350	31	1,141	4,950	5,648,722
1980		1,528	432	30	543	3,235	1,756,827
1981		3,087	176	7	1,666	3,675	6,122,273
1982		3,646	30	11	1,883	3,973	7,482,330
1983		1,864	94	15	859	4,015	3,449,471
1984		1,705	651	7	821	3,807	3,125,911
1985	673	6,376	351	8	2,962	3,741	11,535,461
1986	360	6,546	177	34	2,451	4,355	10,673,138
1987	534	3,808	210	30	1,133	4,379	5,656,145
1988	381	3,608	172	19	1,645	4,879	7,905,702
1989	86	2,372	428	11	1,082	4,139	4,478,045
1990		2,566	40	13	1,063	3,967	4,217,103
1991		1,675	238	10	657	3,886	2,553,218
1992	912	2,370	96	24	1,177	3,988	4,534,404
1993	411	4,451	17	17	1,737	4,090	6,404,312
1994	29	261	4	21	116	4,226	490,249
1995	35	70	59	7	35	3,771	132,000

From 1985 on total eggs taken includes Snake River adults.

Appendix 30. Summary of Returns to Rapid River Hatchery by Brood Year.

Brood year	Year released	Number released	3 year olds	Year returned	4 year olds	Year returned	5 year olds	Year returned	Return from release	% return from release
1964	1966	588,000	1,309	1967	3,422	1968	197	1969	4,658	0.00
1965	1967	479,267	740	1968	2,620	1969	874	1970	4,234	0.89
1966	1968	1,460,150	1,043	1969	5,596	1970	364	1971	7,003	0.48
1967	1969	900,192	887	1970	2,992	1971	1,544	1972	5,416	0.60
1968	1970	3,172,000	1,754	1971	10,766	1972	4,403	1973	16,923	0.53
1969	1971	2,718,720	943	1972	12,654	1973	1,759	1974	15,356	0.56
1970	1972	2,809,200	285	1973	1,698	1974	386	1975	2,370	0.08
1971	1973	2,908,425	538	1974	4,206	1975	1,120	1976	5,864	0.20
1972	1974	2,707,917	573	1975	5,222	1976	634	1977	6,429	0.24
1973	1975	3,373,700	1,765	1976	7,110	1977	1,845	1978	10,720	0.32
1974	1976	3,358,940	437	1977	3,890	1978	2,413	1979	6,740	0.20
1975	1977	2,921,172	34	1978	598	1979	46	1980	678	0.02
1976	1978	2,412,678	350	1979	1,482	1980	146	1981	1,978	0.08
1977	1979	2,866,993	432	1980	3,068	1981	557	1982	4,057	0.14
1978	1980	2,604,823	176	1981	3,089	1982	1,206	1983	4,291	0.16
1979	1981	2,372,607	30	1982	838	1983	356	1984	1,224	0.05
1980	1982	1,476,766	94	1983	1,349	1984	199	1985	1,642	0.11
1981	1983	2,998,103	651	1984	6,177	1985	1,456	1986	8,284	0.28
1982	1984	3,246,197	351	1985	5,090	1986	1,155	1987	6,596	0.20
1983	1985	2,491,238	177	1986	2,444	1987	1,557	1988	4,178	0.17
1984	1986	1,594,688	210	1987	2,051	1988	379	1989	2,640	0.17
1985	1987	2,836,400	172	1988	1,933	1989	135	1990	2,300	0.08
1986	1988	2,630,200	428	1989	2,431	1990	421	1991	3,080	0.12
1987	1989	2,319,500	40	1990	1,254	1991	161	1992	1,455	0.06
1988	1990	2,520,400	238	1991	2,209	1992	1,905	1993	4,352	0.17
1989	1991	2,564,900	96	1992	2,546	1993	122	1994	2,764	0.11
1990	1992	2,615,500	17	1993	139	1994	9	1995	165	0.006
1991	1993	2,060,300	4	1994	61	1995		1996		
1992	1994	2,928,146	59	1995		1996		1997		
1993	1995	3,286,455		1996		1997		1998		
1994	1996	379,167		1997		1998		1999		
1995	1997			1998		1999		2000		

Appendix 31. Average Feed And Growth Data For Rapid River Hatchery 1980-1995.

Month	Average water temperature (F)	Density index	Flow index	Feed conv.	Hatchery constant	Daily length increase	Monthly length increase	condition factor	Percent body weight fed	Number feedings per day	Average #/lb. At end of month	Average length at end of month
FEB	38	N.A.	N.A.	N.A.	1.98	0.0024	0.07	0.00027	1.42	8	1109	1.50
MAR	41	0.24	0.59	1.07	2.26	0.0070	0.20	0.00028	1.89	8	809	1.64
APR	44	0.29	0.64	1.02	3.23	0.0105	0.34	0.00031	2.40	8	439	1.95
MAY	46	0.29	0.74	1.00	4.54	0.0151	0.29	0.00031	2.30	8	271	2.29
JUN	49	0.0	0.69	1.20	7.10	0.0297	0.59	0.00031	2.93	4	136	2.87
JUL	54	0.09	0.83	1.59	7.36	0.0155	0.47	0.00036	2.75	4	79	3.43
AUG	55	0.12	1.33	1.59	7.82	0.0164	0.50	0.00035	2.70	5	49	3.86
SEP	51	0.15	1.57	1.70	8.66	0.0170	0.51	0.00035	2.00	5	36	4.31
OCT	46	0.16	1.69	1.71	5.03	0.0098	0.30	0.00035	1.37	3	30	4.60
NOV	51	0.17	1.81	2.22	1.54	0.0023	0.07	0.00035	0.47	2	28	4.67
DEC	38	0.17	1.88	4.46	2.12	0.0016	0.03	0.00034	0.21	1	30	4.67
JAN	37	0.18	1.89	2.83	1.15	0.0013	0.03	0.00034	0.21	1	29	4.69
FEB	38	0.18	2.01	1.24	1.47	0.0040	0.12	0.00032	0.53	2	26	4.95
MAR	41	0.19	1.97	1.55	3.47	0.0074	0.22	0.00032	0.92	2	22	5.19

Feed conversion is expressed as actual feed weight over weight gain from January 1990-July 1995.

Growth data may vary during periods of high water.

Appendix 32. Release and Transfer Summary for Rapid River Hatchery, 1964-1996.

By	No. Eggs Taken	Egg or Fry Plants and Site			Smolt Plants and Site	Fish/ Pound
1964	887,000	None			588,000 Rapid River	22.6
1995	60,400	None			479,267 Rapid River	23.2
1966	2,296,000	None			1,460,150 Rapid River	25.0
1967	2,055,000	None			900,192 Rapid River	24.0
1968	6,540,000	757,376	eggs	Clearwater H Channel	3,172,000 Rapid River	20.0
1969	5,171,697	497,000	eggs	Dworshak NFH to start Kooskia	2,718,720 Rapid River	21.0
1970	14,560,280	4,417,454	eggs	Sweetwater eye stat.	2,809,200 Rapid river	19.4
		2,224	eggs	Kooskia NFH.	91,800 Lochsa River	19.4
		526,516	eggs	Hayden Ck. Hatchery		
		2,473,983	eggs	Clearwater H Channel		
		4,607,736	eggs	Rapid river Hatchery		
		200,520	fry	Lemhi River		
		353,970	fry	Decker Pond		
		100,000	fry	Sandpoint Hatchery		
1971	6,038,785	600,000	eggs	Hayden Ck. Hatchery	2,908,425 Rapid River	17.0
		53,562	fry	Lemhi River	197,303 SF Clearwater	
		104,300	fry	Red River		
		29,800	fry	Ten Mile Creek		
		44,700	fry	American River		
		14,900	fry	Papoose Creek		
		59,600	fry	Brushy Creek		
		44,700	fry	Fish Creek		
		14,900	fry	Post Office Creek		
		44,700	fry	Squaw Creek (Lochsa)		
		61,500	fry	Lochsa River		
		60,000	fry	Ten Mile Creek		
		200,000	fry	Sandpoint Hatchery		
		401,305	fry	Decker Pond		
1972	15,072,604	5,256,662	eggs	Sweetwater eye stat.	2,707,917 Rapid River	17.5
		3,012,358	eggs	Hayden Creek Hatchery		
		1,293,592	eggs	Red River H Channel		
1973	13,510,464	3,915,900	eggs	Sweetwater eye stat.	3,373,700 Rapid River	14.8
		1,295,424	eggs	Hayden Creek Hatchery	117,000 SF Clearwater	
		104,760	eggs	Hagerman Hatchery		
		502,200	eggs	Crooked R. H Channel		
		702,000	eggs	Kooskia NFH		
		806,400	eggs	Hayden Creek Hatchery		
		504,000	eggs	Minnesota walleye trade		
		210,734	fry	Sandpoint Hatchery		
		206,360	fry	Kooskia NFH		
		88,480	fry	Ten Mile Creek.		
		18,200	fry	Newsome Creek		
		633,000	fry	Lemhi River		
		10,428	fry	Capehom Creek		
1974	6,890,186	809,400	eggs	Hayden Creek Hatchery	3,358,940 Rapid River	18.4
		407,012	eggs	Indian Creek	205,700 SF Clearwater	
		203,500	fry	Sandpoint Hatchery		
		21,840	fry	Capehom Creek		
		59,962	fry	Red River		
		30,750	fry	Newsome Creek		
		10,250	fry	Ten Mile Creek		
		1,140,300	fry	Lemhi River		

Appendix 32. Release and Transfer Summary for Rapid River Hatchery (Cont).

By	No. Eggs Taken	Egg or Fry Plants and Site			Smolt Plants and Site		Fish/ Pound
1975	8,503,606	2,363,200	eggs	Sweetwater eye stat.	2,921,172	Rapid River	15.9
		252,200	eggs	Mullan Hatchery	249,750	SF Clearwater	
		255,000	eggs	Hayden Creek Hatchery			
		280,659	eggs	Indian Creek H Chan.			
		4,906,492	eggs	Rapid River Hatchery			
		34,000	fry	Ten Mile Creek			
		156,000	fry	Lemhi River			
		65,960	fry	SF Clearwater River			
		412,800	fry	Decker Pond			
		209,950	fry	Sandpoint Hatchery			
		36,143	fry	Bear Valley Creek			
1976	11,492,878	1,161,608	eggs	Mullan Hatchery	2,413,678	Rapid River	15.7
		2,937,994	eggs	Sweetwater eye stat.			
		261,900	eggs	Hayden Creek Hatchery			
		261,900	eggs	Sandpoint Hatchery			
		1,267,208	eggs	Mackay Hatchery			
		47,008	fry	Univ. of Idaho			
		3,111,850	fry	Mackay Hatchery			
		104,500	fry	Lolo Creek			
		501,600	fry	Red River Pond			
		80,600	fry	SF Clearwater			
1977	14,160,330	2,633,400	eggs	Sweetwater H stat.	2,866,993	Rapid River	15.0
		2,287,800	eggs	Kooskia NFH	156,362	White Sand C.	
		2,689,000	eggs	Mullan Hatchery	44,373	Newsome Creek	
		288,000	eggs	Hayden Creek Hatchery			
		20,700	eggs	Univ. of Idaho			
		1,007,340	eggs	Crooked River H Chan.			
		723,000	fry	Mackay Hatchery			
		50,800	fry	Decker Pond			
		200,025	fry	Red River Pond			
		265,600	fry	Lemhi River			
		767,322	eggs	Hayden Creek Hatchery	2,604,823	Rapid River	
		970,728	eggs	Mackay Hatchery	57,440	White Sand C.	
1978	10,026,888	1,540,282	eggs	Sweetwater eye stat.			15.0
		706,936	eggs	Dworshak NFH			
		38,160	eggs	Univ. Of Idaho			
		10,864	eggs	U of I Hayden Ck.			
		1,250,010	eggs	Crooked River H Chan.			
		249,696	eggs	Sweetwater eye stat.			
		232,500	fry	Red River Pond			
		10,000	fry	Ten Mile Creek			
		806,400	eggs	Hayden Creek Hatchery	2,372,607	Rapid River	
		330,880	eggs	Dworshak NFH	1,001,700	Snake River	
		293,249	fry	Red River Pond			
1979	5,646,722						
1980	1,756,827	None			1,473,733	Rapid River	28.0
1981	6,122,273	608,384	eggs	Pahsimeroi Hatchery	2,998,103	Rapid River	22.0
		256,608	eggs	Oxbow Hatchery	250,020	Snake River	27.0
		449,280	eggs	Dworshak NFH			
1982	7,420,450	493,346	eggs	Looking Glass (Ore)	3,246,197	Rapid River	20.0
		1,332,200	eggs	Pahsimeroi Hatchery	500,850	Snake River	27.0
		375,028	eggs	Dworshak NFH			
		125,055	eggs	Hagerman NFH			
		306,000	fry	Red River Pond			

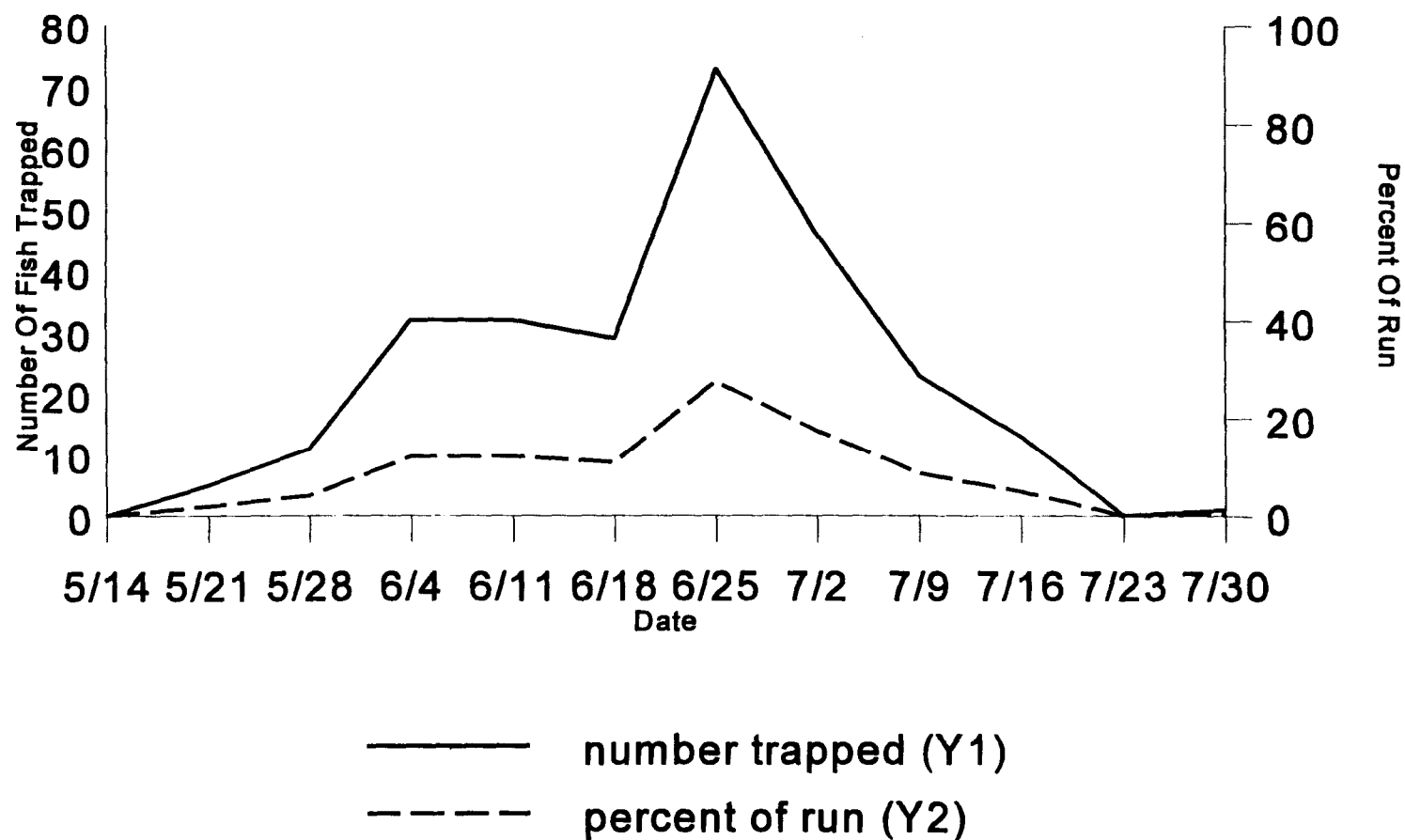
Appendix 32. Release and Transfer Summary for Rapid River Hatchery (Cont).

By	No. Eggs Taken	Egg or Fry Plants and Site			Smolt Plants and Site		Fish/ Pound
1983	3,449,471	None			2,491,238	Rapid River	23.0
					437,360	Snake River	27.0
1984	3,125,911	152,000	fry	Red River	159,688	Rapid River	22.0
					140,000	Snake River	20.0
					136,000	Red River	30.0
1985	11,535,461	497,520	eggs	Oregon	2,630,200	Rapid River	22.5
		3,668,000	eggs	Dworshak NFH	103,000	Snake River	31.1
		2,450,907	eggs	Sawtooth Hatchery			
		100,590	fry	Boulder Creek			
		349,650	fry	Crooked River			
		200,158	fry	Eldorado Creek			
		55,123	fry	Hopeful Creek			
		144,443	fry	Crooked Fork Creek			
		70,282	fry	White Sand Creek			
		49,437	fry	Ten Mile Creek			
		102,282	fry	Newsome Creek			
		115,352	fry	Brushy Fork Creek			
1986	10,673,138	2,368,400	eggs	Dworshak NFH	2,630,200	Rapid River	19.0
		712,905	eggs	Sawtooth Hatchery	400,600	Snake River	19.8
		348,600	fry	Crooked Fork Creek			
		202,400	fry	White Sand Creek			
		98,000	fry	Big Flat Creek			
		238,900	fry	Red River Pond			
1987	5,656,145	30,000	fry	Little Salmon River	2,319,500	Rapid River	22.0
		103,800	fry	Lolo Creek	500,000	Snake River	20.
		137,800	fry	Eldorado Creek			
		62,200	fry	Crooked Fork Creek			
		108,300	fry	Hopeful Creek			
		72,200	fry	White Sand Creek			
		19,500	fry	Big Flat Creek			
		113,800	fry	American River			
		112,100	fry	Newsome Creek			
		100,100	fry	Meadow Creek			
		200,100	fry	Crooked River			
		50,100	fry	Red River			
		50,100	fry	Yankee Fork			
		202,000	fry	Brushy Fork			
		150,100	fry	Ten Mile Creek			
		100,200	fry	White Sand Creek			
1988	7,881,379	1,475,677	eggs	Oregon Fish and Game	2,520,400	Rapid River	26.0
		149,570	fry	Little Salmon River	250,000	Little Salmon	27.8
		100,278	fry	Ten Mile Creek	551,200	Snake river	30.0
		149,570	fry	Little Salmon River			
		100,278	fry	Ten Mile Creek			
		101,062	fry	Crooked River			
		100,862	fry	Crooked River			
		100,628	fry	Newsome Creek			
		100,299	fry	Boulder Creek			
		100,342	fry	Boulder Creek			
		100,097	fry	Newsome Creek			
		195,398	fry	Brushy Fork			
		99,919	fry	White Sands Creek			

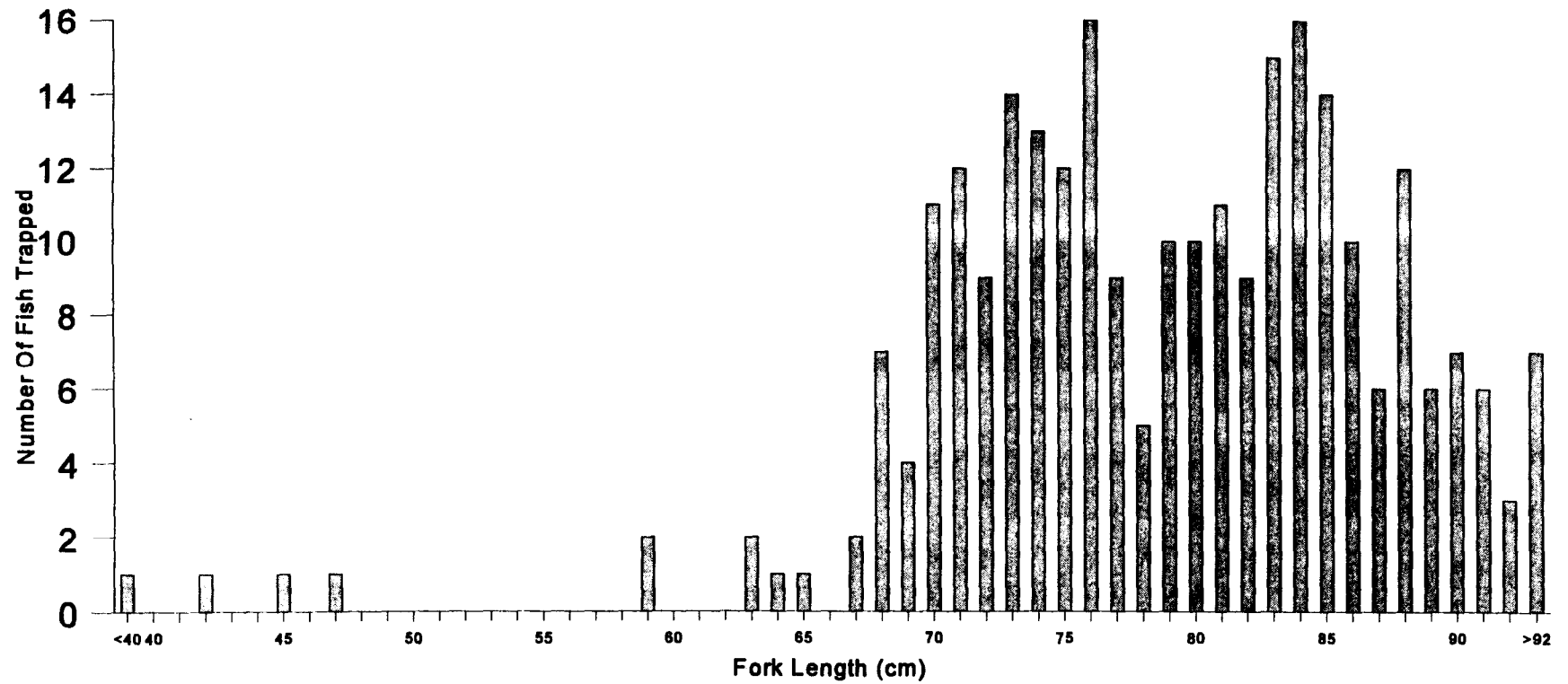
Appendix 32. Release and Transfer Summary for Rapid River Hatchery (Cont).

By	No. Eggs Taken	Egg or Fry Plants and Site			Smolt Plants and Site		Fish/ Lb.
1988		100,148	fry	White Sands Creek			
		99,401	fry	American River			
		51,369	fry	American River			
		39,163	fry	Meadow Creek			
1989	3,925,585	211,509	fry	Crooked River	25,649	Rapid River	24.2
		548,876	fry	Sawtooth Hatchery	100,100	Little Salmon	22.5
					500,500	Snake River	22.5
1990	4,271,103	200,000	eggs	Looking Glass Hatch.	2,615,500	Rapid River	20.3
		403,400	fry	Sawtooth Hatchery	500,500	Snake River	20.3
1991	2,553,218	3,050	fry	Hayden Creek Hatchery	2,060,300	Rapid River	24.7
		10,126	fry	Squaw Creek	200,300	Snake River	26.8
		90,125	fry	White Sands Creek			
1992	4,534,404	92,897	eggs	Dworshak Hatchery	2,547,624	Rapid River	20.4
					380,600	Snake River	20.5
1993	6,404,312	2,176,157	eggs	Clearwater Hatchery	2,786,919	Rapid River	18.5
					499,536	Snake River	19.1
1994	490,249	58,791	eggs	Clearwater Hatchery	379,167	Rapid River	16.8
1995	132,002	18,575	eggs	Clearwater Hatchery			

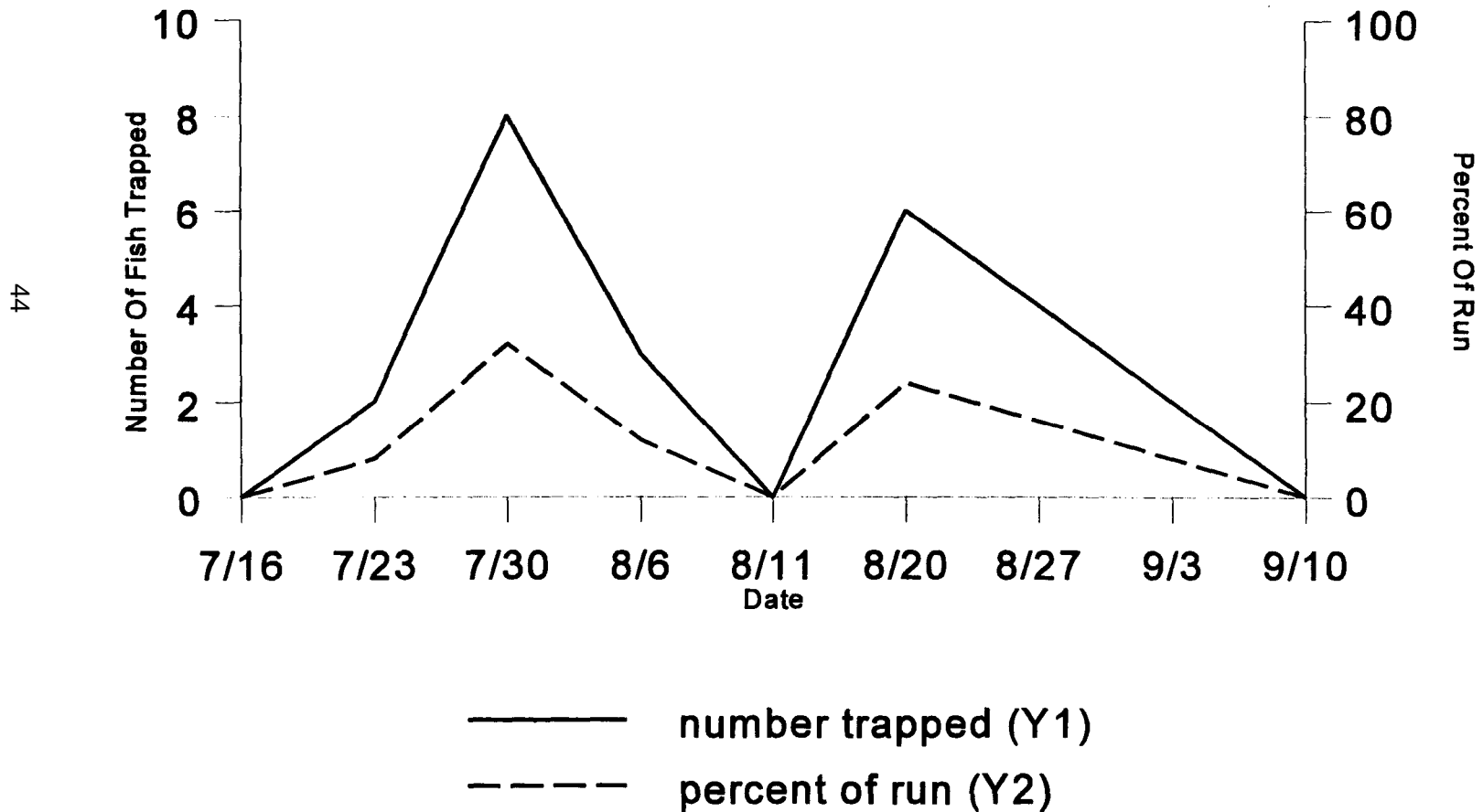
1994 Rapid River Spring Chinook Returns WEEKLY TRAP COUNT



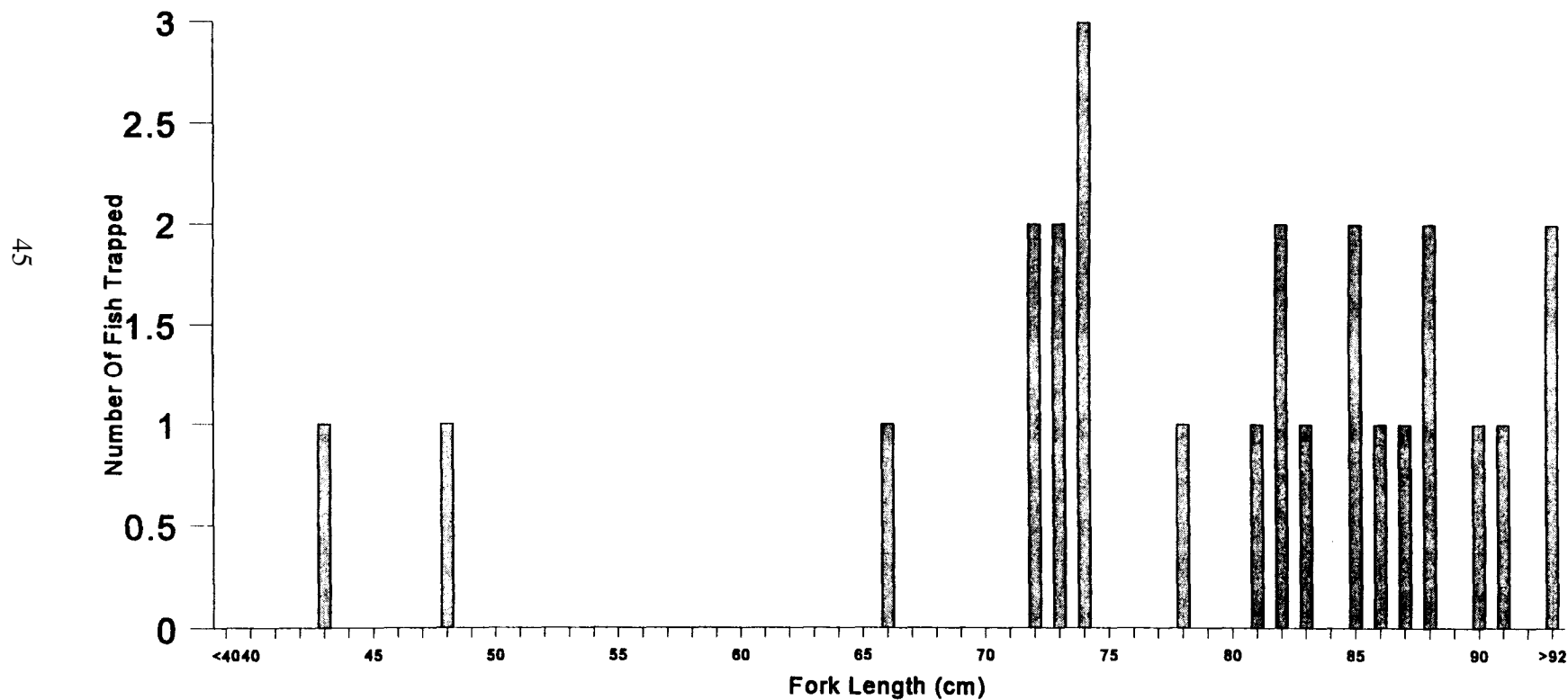
1994 Rapid River Spring Chinook Returns LENGTH FREQUENCY



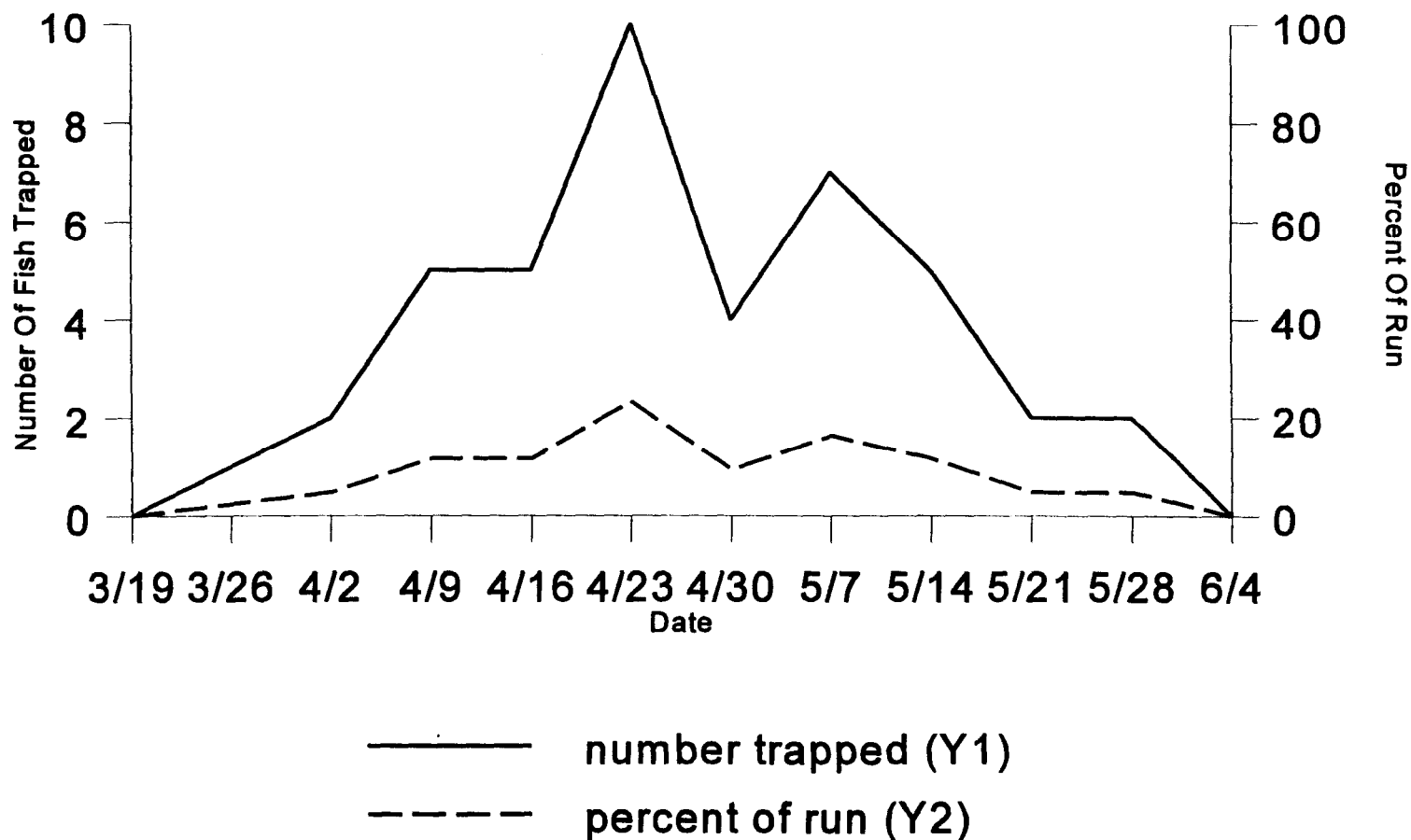
1994 Rapid River Summer Chinook Returns WEEKLY TRAP COUNT



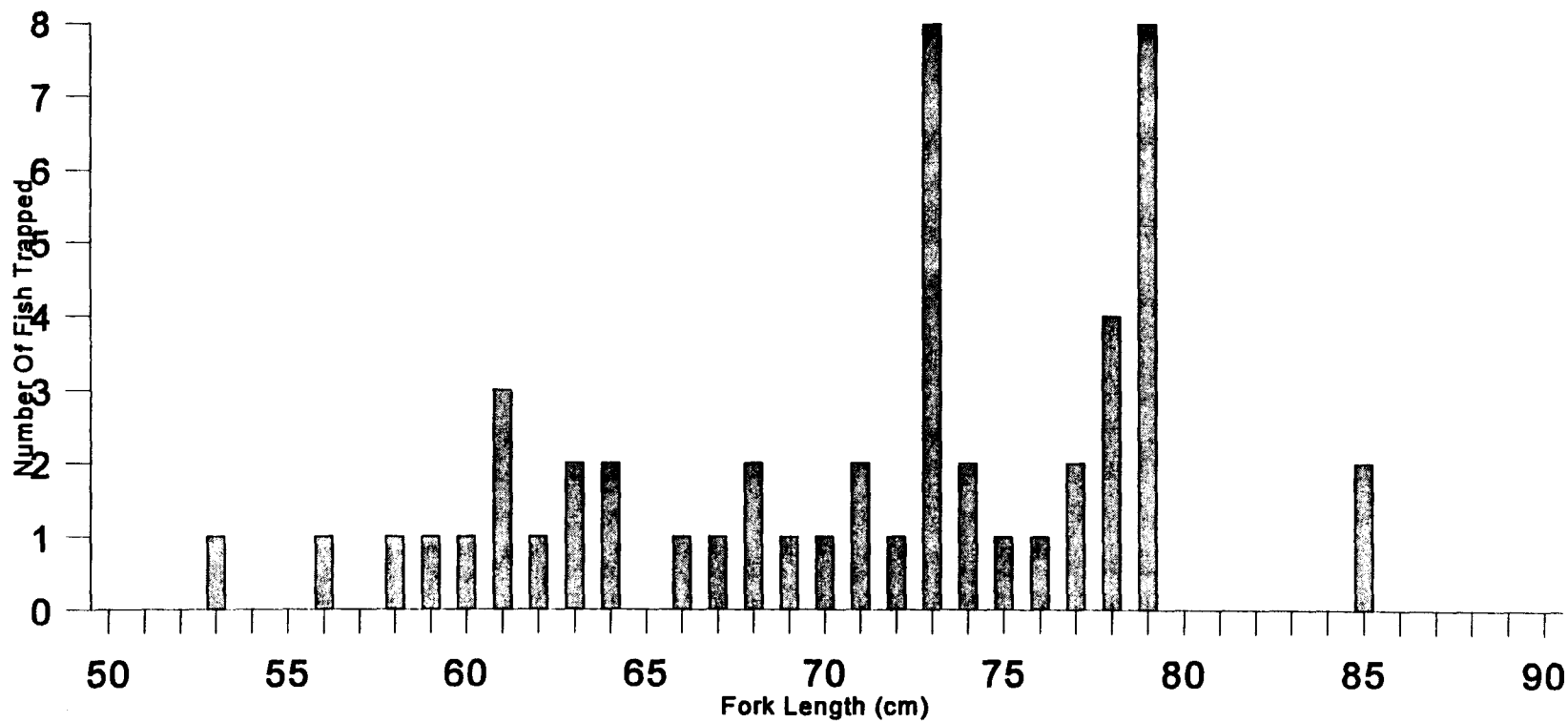
1994 Rapid River Summer Chinook Returns LENGTH FREQUENCY



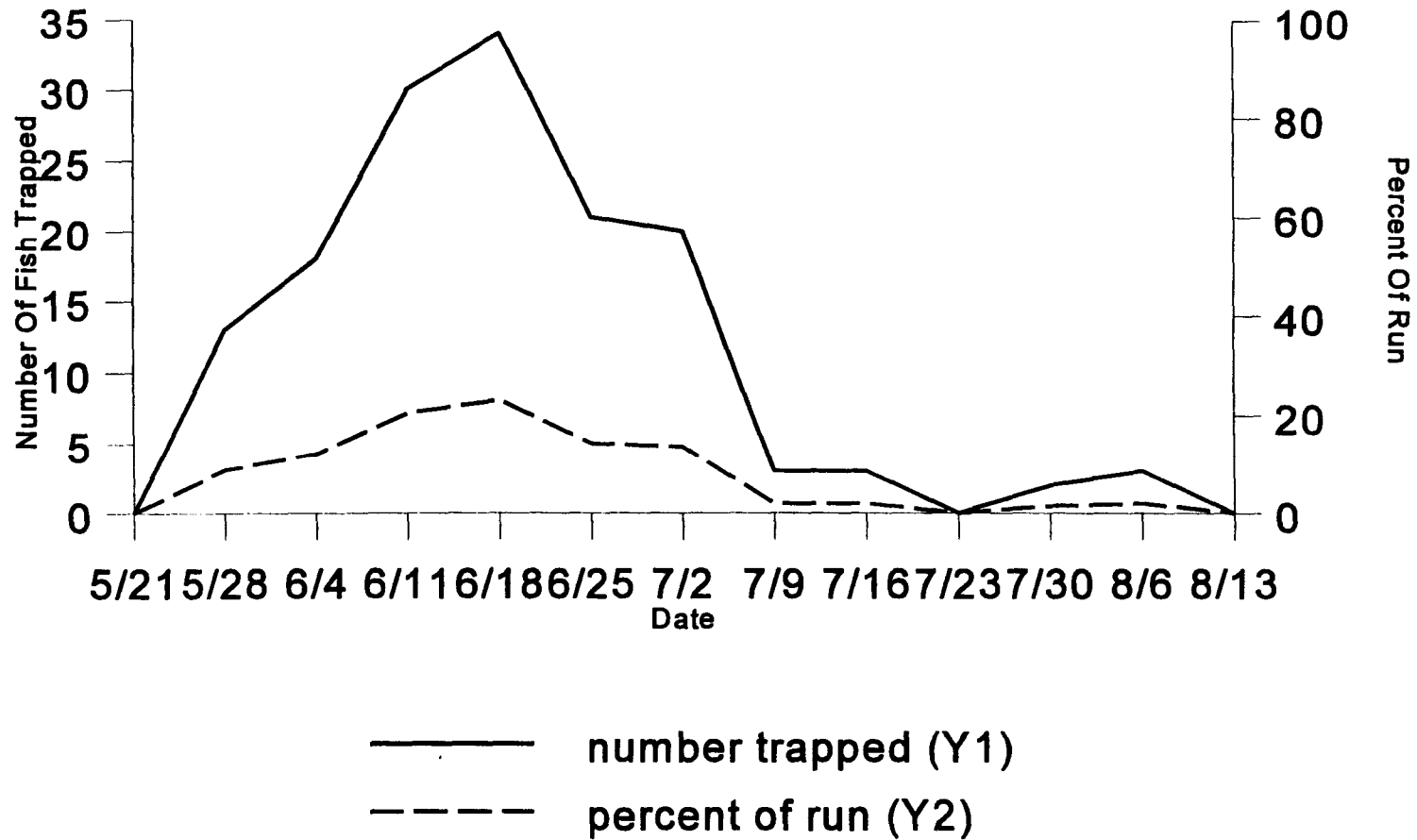
1994 Rapid River Steelhead Returns WEEKLY TRAP COUNT



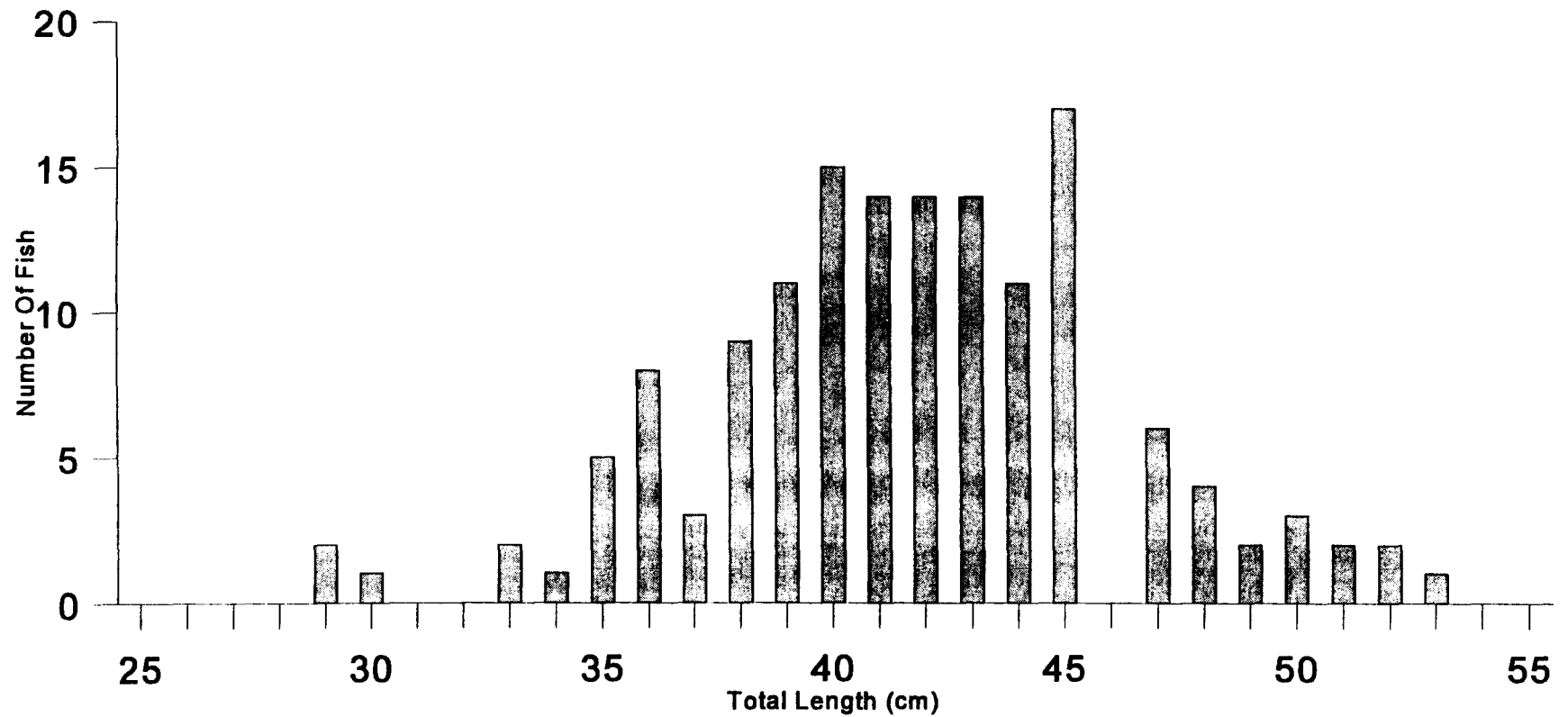
1994 Rapid River Steelhead Returns LENGTH FREQUENCY



1994 Rapid River Bull Trout Returns WEEKLY TRAP COUNT

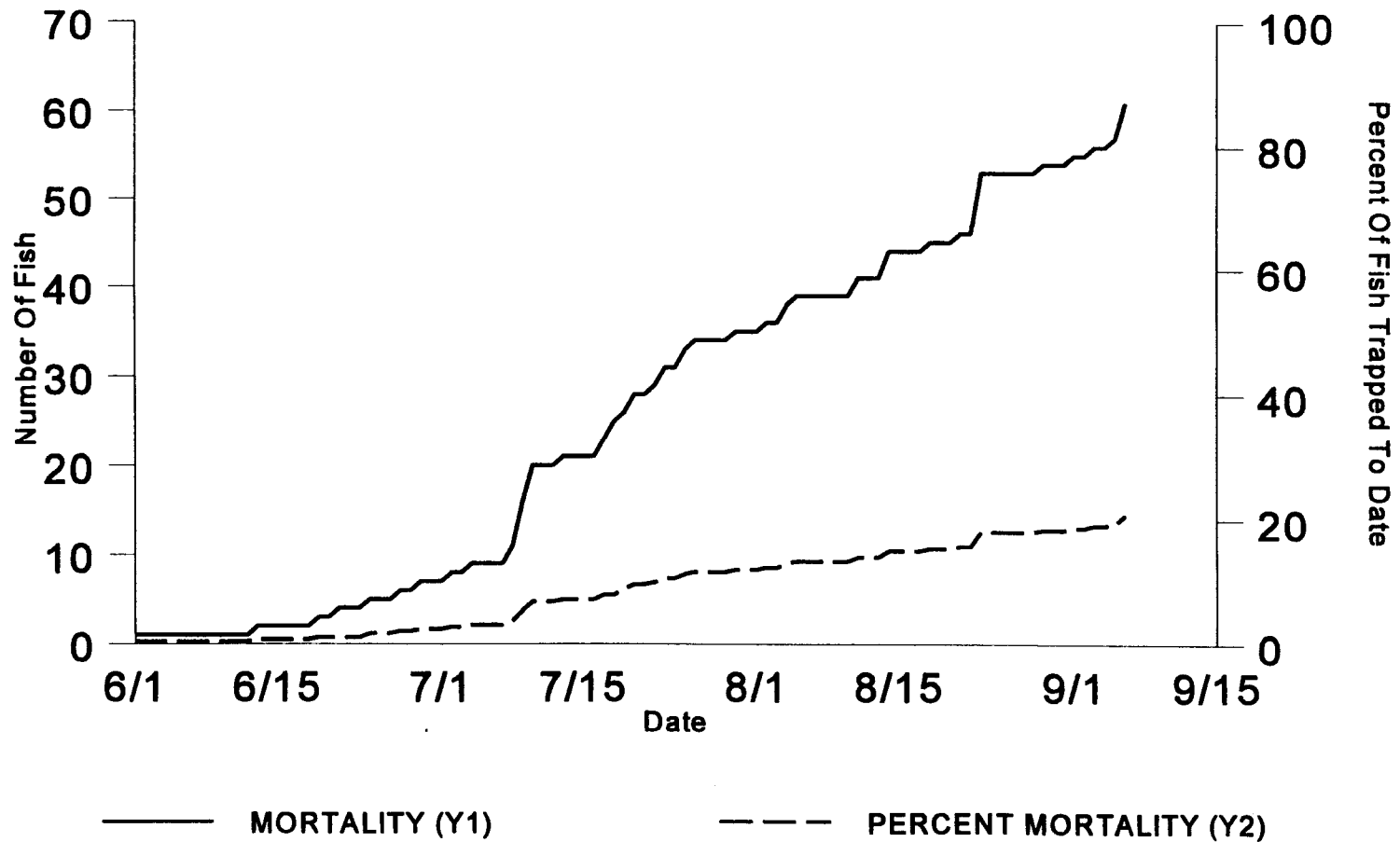


1994 Rapid River Bull Trout Returns LENGTH FREQUENCY



RAPID RIVER HATCHERY B.Y. - 1994

CUMULATIVE PRE-SPAWNING MORTALITY



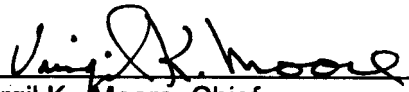
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